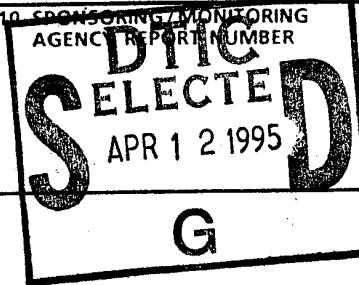


| REPORT DOCUMENTATION PAGE   |   |   | Form Approved<br>OMB No. 0704-0188 |
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| 1. AGENCY USE ONLY (Leave blank)  | 2. REPORT DATE                                  | 3. REPORT TYPE AND DATES COVERED  |                                    |
|   | August 1994                                     | Final Report (07-93 to 09-94)   |                                    |
| 4. TITLE AND SUBTITLE<br>A NON-TRADITIONAL METHODOLOGY FOR DETERMINING THE COST OF GRADUATE MEDICAL EDUCATION WITHIN THE ARMY MEDICAL DEPARTMENT  |   | 5. FUNDING NUMBERS  |                                    |
| 6. AUTHOR(S)<br>CAPTAIN GARY G. MCNEILL, MEDICAL SERVICE CORPS  |   |   |                                    |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>Headquarters, US Army Medical Command (Provisional)<br>Fort Sam Houston, TX 78234-6000  |   | 8. PERFORMING ORGANIZATION REPORT NUMBER<br>31a-94  |                                    |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)<br>U.S. Army-Baylor University Graduate Program in Health Care Administration<br>Army Medical Department Center and School (HSHA-MA)<br>Fort Sam Houston, TX 78234-6100   |   | 10. SPONSORING/MONITORING AGENCY REPORT NUMBER<br><br>G |                                    |
| 11. SUPPLEMENTARY NOTES   |   |   |                                    |
| 12a. DISTRIBUTION/AVAILABILITY STATEMENT<br>APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED  |   | 12b. DISTRIBUTION CODE  |                                    |
| 13. ABSTRACT (Maximum 200 words)<br>This study details an innovative methodology for costing graduate medical education (GME) by specialty in a federal, multi-institutional health care system. Differences in expenses, captured by the Medical Expense Performance Reporting System (MEPRS), between teaching and non-teaching facilities with comparable workload were adjusted for severity of illness with the remainder being attributed to GME. Annual costs per orthopedic resident and OBGYN intern/resident are \$215,425 and \$182,775 respectively.<br><br>The development of this methodology has enabled the Army Medical Department to determine the cost for orthopedics and OBGYN residency programs with minimal expenditure of resources. Additionally, results obtained through the application of this methodology may be used as a benchmark for future internal and external comparisons. |   |   |                                    |
| DTIC QUALITY INSPECTED 5  |   |   |                                    |
| 14. SUBJECT TERMS<br>Graduate Medical Education, Orthopedics, Obstetrics and Gynecology, OBGYN, Costing, Costs, MEPRS, Teaching Costs   |   |   | 15. NUMBER OF PAGES<br>74          |
|   |   |   | 16. PRICE CODE                     |
| 17. SECURITY CLASSIFICATION OF REPORT<br>N/A  | 18. SECURITY CLASSIFICATION OF THIS PAGE<br>N/A | 19. SECURITY CLASSIFICATION OF ABSTRACT<br>N/A  | 20. LIMITATION OF ABSTRACT<br>UL   |

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U. S. ARMY-BAYLOR UNIVERSITY GRADUATE  
PROGRAM IN HEALTH ADMINISTRATION

A NON-TRADITIONAL METHODOLOGY FOR  
DETERMINING THE COST OF  
GRADUATE MEDICAL EDUCATION  
WITHIN THE ARMY MEDICAL DEPARTMENT

A GRADUATE MANAGEMENT PROJECT  
SUBMITTED TO THE FACULTY OF  
Baylor University  
IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF  
MASTERS OF HEALTH ADMINISTRATION

HEALTH CARE ADMINISTRATION DIVISION

BY  
CAPTAIN GARY G. MCNEILL

FORT SAM HOUSTON, TEXAS

JUNE 1994

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## ACKNOWLEDGEMENTS

I would like to express my extreme gratitude to Mr. Jim Jensen of the resource management office at Headquarters, US Army Medical Command (Provisional). His hours of assistance downloading MEPRS data, parsing data into useable spreadsheets, assisting with acuity adjustments, and offering guidance was invaluable.

The analytical guidance I received from Lieutenant Colonel Michael Kennedy and Dr. Kenn Finstuen during the evolution of the study was greatly appreciated and provided the insight required to complete this project.

Of course this study was conceived from the leadership of Brigadier General John Cuddy and Colonel Philip Dorsey. Their ideas and faith in my abilities gave me the confidence to take on the study as my Graduate Management Project. I would also like to extend my sincere appreciation to my preceptor, Colonel Henry Tuell, for his ever present support during this residency year.

Most of all I must thank my wife Carol who listened to my daily dissertation of any and everything that had to do with graduate medical education. Her patience, understanding, and support helped me stay focused on the goal of completion.

## ABSTRACT

This study details an innovative methodology for costing graduate medical education (GME) by specialty in a federal, multi-institutional health care system. Differences in expenses, captured by the Medical Expense Performance Reporting System (MEPRS), between teaching and non-teaching facilities with comparable workload were adjusted for severity of illness with the remainder being attributed to GME. Annual costs per orthopedic resident and OBGYN intern/resident are \$215,425 and \$182,775 respectively.

The development of this methodology has enabled the Army Medical Department to determine the cost for orthopedics and OBGYN residency programs with minimal expenditure of resources. Additionally, results obtained through the application of this methodology may be used as a benchmark for future internal and external comparisons.

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**LIST OF FACILITY ABBREVIATIONS BY REGION**

| <u>Abbreviation</u> | <u>Facility Name</u>     | <u>Location</u>       |
|---------------------|--------------------------|-----------------------|
| BAMC                | Brooke AMC               | Fort Sam Houston, TX  |
| HOOD                | Darnell ACH              | Fort Hood, TX         |
| PANAMA              | Gorgas ACH               | Panama                |
| POLK                | Bayne-Jones ACH          | Fort Polk, LA         |
| SILL                | Reynolds ACH             | Fort Sill, OK         |
| EAMC                | Dwight D. Eisenhower AMC | Fort Gordon, GA       |
| BENNING             | Martin ACH               | Fort Benning, GA      |
| STEWART             | Winn ACH                 | Fort Stewart, GA      |
| MCCLELLAN           | Noble ACH                | Fort McClellan, AL    |
| REDSTONE            | Fox ACH                  | Redstone Arsenal, AL  |
| RUCKER              | Lyster ACH               | Fort Rucker, AL       |
| CAMPBELL            | Col. F. Blanchfield ACH  | Fort Campbell, KY     |
| JACKSON             | Moncrief ACH             | Fort Jackson, NC      |
| FAMC                | Fitzsimons AMC           | Aurora, CO            |
| CARSON              | Evans ACH                | Fort Carson, CO       |
| LEAVEN              | Munson ACH               | Fort Leavenworth, KS  |
| RILEY               | Irwin ACH                | Fort Riley, KS        |
| LWOOD               | General Leonard Wood     | Fort Leonard Wood, MO |
| MAMC                | Madigan AMC              | Tacoma, WA            |
| ALASKA              | Bassett ACH              | Fort Wainright, AK    |
| ORD                 | Silas B. Hays ACH        | Fort Ord, CA          |
| TAMC                | Tripler AMC              | Oahu, HI              |
| WBAMC               | William Beaumont AMC     | El Paso, TX           |
| IRWIN               | Weed ACH                 | Fort Irwin, CA        |
| HUACHUCA            | Raymond W. Bliss ACH     | Fort Huachuca, AZ     |
| WRAMC               | Walter Reed AMC          | Washington, DC        |
| BELVIOR             | DeWitt ACH               | Fort Belvior, VA      |
| EUSTIS              | McDonald ACH             | Fort Eustis, VA       |
| LEE                 | Kenner ACH               | Fort Lee, VA          |
| MEADE               | Kimbrough ACH            | Fort Meade, MD        |
| WPOINT              | Keller ACH               | West Point, NY        |
| MONMOUTH            | Patterson ACH            | Fort Monmouth, NJ     |
| DEVENS              | Cutler ACH               | Fort Devens, MA       |
| BRAGG               | Womack ACH               | Fort Bragg, NC        |
| KNOX                | Ireland ACH              | Fort Knox, KY         |
| BHARR               | Hawley ACH               | Fort Ben Harrison, IN |

## CHAPTER 1

### INTRODUCTION

#### History of Army Graduate Medical Education

Medical education has been present in the military since 1893, when Surgeon General George M. Sternberg established the Army Medical School (Engleman and Joy 1975). In 1920 the Army created an internship program to compete with civilian programs and attract graduates from top medical schools to the military. Starting with only six interns, the program grew to 60 by July, 1924. Recruitment of quality medical officers ceased to be a problem with the arrival of the depression in 1937. During this period there was a plethora of applicants who realized that income, on average, was higher within the military than outside; and therefore the internship program was terminated until after World War II (Whelan 1974, 266).

In 1943 the Army Specialized Training Program was implemented to accelerate the educational process for medical ROTC graduates, so that they could be available for military service sooner than through the normal student deferments. Additionally, from 1942-1945, six to 12 week professional refresher courses for trained physicians were initiated in 22 civilian hospitals, as well as courses taught by well known civilian specialists in Army hospitals. Army and Navy residency

programs were established in 1947 (Whelan 1974, 267).

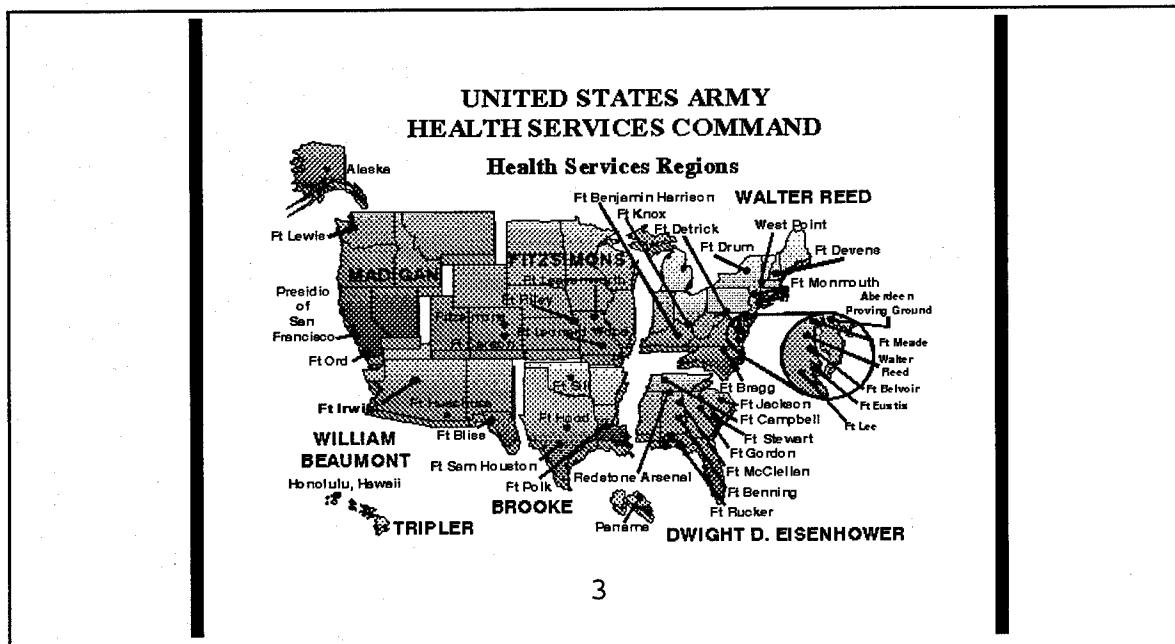
The reasons were compelling: (1) the well-trained specialist in the Armed Services during the war would be returning to civilian life; (2) the regular Army and Navy medical officers had in large measure been in command and staff positions during the war and for four years had not practiced medicine; (3) there were very few regular medical officers who were Board-certified prior to the war; (4) in order to give quality medical care, specialists must be trained from the source of regular medical officers; and (5) quality training programs were needed to attract other young medical officers--medical graduates and partially-trained physicians--to the Armed Services (Whelan 1974, 267).

Major General Raymond E. Bliss, Army Surgeon General from 1947-1951, continued to upgrade the training to "influence good young men to enter the graduate medical education programs, to stimulate a professional environment of highest calibre and to upgrade the quality of health care in the Army" (Whelan 1974, 267). Through an evolutionary process, and in tandem with national trends, Army internship programs began to offer specialized Graduate Medical Education programs in a great variety of career choices (Ledford and Driskill 1976, 837).

Graduate Medical Education (GME) refers to that structured clinically based education by which physicians obtain those additional qualifications, beyond medical school graduation, required for certification in a medical or surgical specialty. GME programs must comply with specified criteria to gain accreditation (Society of Medical Consultants to the Armed Forces 1987, 1).

The scope of present Army GME encompasses 78 residency programs in 23 specialties and 68 fellowship programs in 43 specialties. Of the Army's 38 facilities, eight medical centers and 3 medical activity hospitals are utilized for Army GME and accreditation is approved by the Accreditation Council for Graduate Medical Education (ACGME) (Cassimatis 1993).

The Army is well equipped to offer opportunities in GME by virtue of the fact that the Army Medical Department (AMEDD) is the largest comprehensive health care system in the nation. "The three military medical departments are responsible for providing medical care to about [8.4 million beneficiaries]: 2 million active duty personnel, 2.5 million dependents, and 3.9 million retirees, their families, and civilian[s] . . ." (Institute of Medicine 1981, 3). Of that number, the U.S. Army Health Services Command (HSC), created in 1973, is responsible for the delivery of health care to over 3.5 million active duty soldiers, retirees, and soldier/retiree family members. With a \$4.2 billion annual budget and more than 50,000 employees, HSC operates eight Army medical centers, 30 installation medical activities, 38 dental activities, plus many clinics at remote installations (U.S. Department of the Army Health Services Command 1992, 3). Figure 1 depicts the location of HSC facilities by regions.



**Figure 1.** U.S. Army Health Services Command Facilities.  
(U.S. Army Health Services Command 1993).

Army physicians can choose from most specialties offered in civilian medical schools, but have unique opportunities in basic or applied research in mechanical, thermal, and radiation trauma, nutrition, physiologic effects of flight, altitude, biomechanics, and prosthetics. The Army offers specialties such as aerospace medicine, preventive medicine, and occupational medicine, which are especially military oriented. Additionally, the Army has many senior teaching chiefs with first-hand knowledge of war surgery and battlefield casualties. These are all vital elements for attraction of physicians into the Army, but are also strong incentives for retention. Without the potential for teaching in GME programs and practicing in a quality professional environment, many of the best physicians would be lost to civilian teaching institutions. "It would be impossible to retain the better physicians" without GME in the AMEDD (Ledford and Driskill 1976, 840). Bircher and Ziskind confirmed this finding for the Air Force and demonstrated that "military GME increased the odds five fold of a physician staying beyond his initial commitment" (Bircher and Ziskind 1976, 3). Without GME the AMEDD could be left with marginal performers unable to compete in the civilian marketplace, as well as a mediocre health care system.

In October of 1987 the Society of Medical Consultants to the Armed Forces met with an interest ". . . to be certain that the interdependent contingency readiness and peacetime medical support be kept in balance and that the highest quality health

care be assured those on active duty, their families and retirees". They suggested that "there remains today a consensus in medical circles that Graduate Medical Education is the chief guarantor of quality medical care and an unmatched incentive for the recruitment of active duty medical officers." Additionally, they cite two functions of GME programs in military hospitals as being: "(1) to affect the quality and quantity of patient care, and (2) to affect the quality and quantity of the military physician manpower pool" (Society of Medical Consultants to the Armed Forces 1987, 2).

#### GME Funding

GME is paid for by patients, state governments, the federal government, and private third-party payers, but primarily from the latter two. In the past, direct and indirect costs could be included with other billable hospital costs, but with cost containment issues at the forefront of concerns many insurers are reluctant to support GME.

Medicare shifted its payment system for inpatient operating costs from a retrospective cost-based system to a prospective case payment system on October 1, 1983. The prospective payment system for hospitals, adopted by Congress, is a diagnosis-related group (DRG) based pricing system. Basic payment rates provide a fixed payment to the hospital based on the type of case (or DRG). These payments are based on national standardized cost per Medicare discharge by DRG. Separate rates are computed for hospitals in large urban areas and rural areas. Adjustments to

the basic payment rates are based on characteristics of each institution, including local prevailing hospital wages, inflation, and case mix.

Direct medical expenses are one component of the cost of GME programs and include salaries and benefits for teaching physicians, as well as residents, classrooms, libraries and other facilities. Reimbursement for direct GME costs by Medicare is for the portion of services provided to Medicare patients only. The payment formula is shown below:

$$(\text{Labor Related Cost per Discharge}) (\text{Area Wage Index}) + (\text{Non-labor Related Cost per Discharge}) = \text{Wage Adjusted National Standardized Cost Per Discharge}$$
$$(\text{Wage Adjusted NSCPD}) (\text{DRG Relative Weight}) = \text{Basic DRG Payment}$$

Additional payments are made for extraordinarily costly cases and if a disproportionate share of low income patients are served. Indirect costs are the other component and consist of additional patient care costs incurred by institutions with GME programs. Reimbursement of indirect costs is intended to recognize higher costs of teaching hospitals due to patients with higher acuities, larger proportions of uncompensated care, indirect medical education expenses, and more expensive diagnostic procedures used by teaching services.

Costs initially reimbursed on the basis of cost, outside of prospective payments, include: capital-related cost, direct medical education expenses, and organ acquisition costs. In 1985, a fixed prospective payment per resident was paid to cover

direct medical education costs. In July, 1986 Medicare began to provide 100 percent reimbursement for direct medical education costs only for the minimum number of years necessary to satisfy the requirements for initial board eligibility, plus one year, for a maximum of five years. In 1991 fixed prospective payments began to cover capital-related expenses as well (Health Care Financing Administration 1993).

Under the present proposal for the Clinton Health Reform Plan, a national pool of funds to support the institutional costs of research and development of new technology, treatment of rare illnesses, and specialized care would be created. Funds would be allocated to academic health centers that operate teaching hospitals with approved physician training programs as determined by Health and Human Services. Payments made to eligible programs would be calculated on the basis of the number of full-time equivalent training participants, as well as the national average of training program costs, including the national average salary of participants and faculty. Graduate medical education programs would also be restructured to promote primary care training (Ernst and Young 1994, 8).

#### Conditions Which Prompted the Study

As the "purse strings" for funding GME continue to draw tighter and governmental controls to reduce specialty physicians take hold, military training facilities will find it significantly more difficult to maintain their current level of "other than primary care" training programs. Congress

commissioned a study in 1991 to define the current "go-to-war" personnel requirements for the Department of Defense (DoD). A portion of the study examines how DoD should deliver health care to its beneficiaries. Once the "go-to-war" requirement is established, additional personnel requirements would only be authorized if they were considered to be cost effective. One of the findings of this study identified that the Army was training more physicians than required to meet the "go-to-war" requirement. Therefore, the only means to maintain this GME training base was to show that it was less expensive for the military to train additional physicians than it was to pay for the alternative. This alternative involves sending physicians for specialty training to civilian institutions or providing the lost "in-house" beneficiary care through the Civilian Health and Medical Program for the Uniformed Services (CHAMPUS) (Brandel 1994).

Another study, conducted by the DoD Program, Analysis, and Evaluation Office (DPA&E), examined the effects of GME on medical costs and the size of GME programs. Their conclusions were that "GME (Internship, Residency, Fellowship) programs at DoD medical centers are a major source of specialty physicians [and] some amount of GME in DoD is desirable for a number of reasons concerning the quality of DoD physicians and the care they provide." However, they also stated that "there are other sources of trained physicians and that GME is costly" (U.S. Department of Defense 1993).

The PA&E study found that GME raised the costs of providing health care while adversely affecting hospital operations. Compensation of students, increased numbers of diagnostic tests found in GME facilities, and problems associated with GME accreditation were all cited as having a negative impact on providing cost effective and efficient health care. According to a briefing given in October, 1993 to the HSC Board of Directors, GME appears to raise the cost of treatment by approximately \$90,000 per student physician in DoD facilities. Additionally, excess capacity among the training facilities lead the Army to offer up 270 GME positions to the other services in 1994. The DPA&E researchers made three alternative recommendations as follows:

**Alternative #1 (The status quo)**

- Adjust the size of individual programs (within accreditation constraints) to recognize the decline in available physician-students.
- Continue efforts to affiliate with non-DoD programs (with consequent loss of control and flexibility).
- Possibly admit non-DoD residents to DoD programs.
- Maintain the present number of medical centers and almost all programs at those centers.

**Alternative #2 (Eliminate excess capacity)**

- Direct DoD Health Affairs and the services to reduce GME programs by 450 physician-students.
- Reduce capacity by closing all programs at medical centers

with relatively weak programs (reducing the medical centers to medical department activities).

- Generate much larger savings of \$24 million.
- Increase the strength of the remaining programs.

**Alternative #3 (Substitute civilian training)**

- Direct DoD Health Affairs to reduce GME by 700 physicians.
- Reduce capacity by closing all programs at medical centers with relatively weak programs (reducing the medical centers to station hospitals).
- Generate greater savings than alternative 1 or 2 (an additional \$30 million per year).
- Increase reliance on less-expensive civilian GME programs (U.S. Department of Defense 1993).

Since approximately thirty percent of the Medical Corps' officer strength consists of personnel engaged in GME, which is considered to be extremely expensive, it was recommended that the AMEDD restructure/reduce the number of GME programs and students among its eight medical centers. It was believed that this reduction, coupled with an initiative to procure GME through civilian institutions, would provide a significant savings, while meeting the desired force reductions necessary to meet required end strength.

These recommendations met resistance from The Surgeon General (TSG) and other GME stakeholders within the AMEDD. TSG takes the position that GME is the building block of Army medicine and that any reduction of GME programs among the medical

centers would have negative long-term effects. From a readiness point of view, he states that the AMEDD will need its present number of GME programs to provide an adequate number of trained specialists in the event that the nation should enter into another major conflict. According to the U.S. Army Health Services Command (HSC) Board of Directors, the philosophy concerning GME is as follows:

GME is absolutely essential within the Armed Services as a principle component of continuously improving our readiness posture, the quality of health care, and the cost effectiveness of health care. (GME means Readiness, Quality, and Cost Containment) (U.S. Department of the Army Health Services Command 1992a, 5).

Additionally, many of these programs are dependent upon each other, making it difficult to remove just one or two from a medical center without having a major impact on the viability of the remaining programs.

Arguments from stakeholders proposing that GME could be purchased from private institutions are countered by those that predict the end product would not be comparable to that trained within Army health care facilities. Attributes such as loyalty, flexibility, ethics, sense of duty, and an understanding of the beneficiary population, which are difficult to place a numerical value on, would not be evident among specialists procured through a civilian program.

For these reasons and others, TSG is searching for a way to show that Army GME is at least as cost effective as that purchased through the civilian sector. Before this can take place, the AMEDD must be able to measure the cost of its GME

programs. Breaking out the cost of GME from patient care and research has been a problem for military and civilian institutions for years. Until prospective payment of DRGs began in 1983, medical treatment facilities were not concerned about the cost of providing care. Therefore, accounting procedures were not designed to capture cost so that GME expenses could be separated from those of research and treatment. This was also the case for the military health care system.

The Military Expense Performance Reporting System (MEPRS), which records manpower, performance and expense data for fixed facilities, was developed to provide detailed information regarding: uniform performance indicators, common expense classification by work centers, uniform reporting of personnel utilization data by work centers, and a cost assignment methodology for ancillary and support services (U.S. Department of Defense, Assistant Secretary of Defense (Health Affairs), Assistant Secretary of Defense (Force Management and Personnel), and Comptroller of the Department of Defense, 1991, 1-3).

Using data from the MEPRS system, Brooke, Hudak, and Finstuen (1993), faculty of the U.S. Army-Baylor Graduate Program in Health Administration, were tasked by the Deputy Commander, Health Services Command to develop a method of costing GME. The end product, discussed in the literature review, was a noteworthy piece of research that provided the information desired, but the methodology was somewhat complex, difficult to understand, and resource intensive to replicate.

Another study, using MEPRS data, was attempted by the Health Care Studies Division of the AMEDD Center and School. However, the study is incomplete at this time and a request for additional resources and time to complete the project is pending.

Desiring to expeditiously support TSG and develop a methodology that could be easily replicated, the Deputy Commander, Health Services Command called together a group of six individuals with varying degrees of experience in health care delivery and administration. The administrative resident was a member of this group and was tasked to develop the methodology previously addressed. The Chief of Staff, Colonel Philip Dorsey, suggested that a simple approach be taken, comparing the difference in expenses captured through MEPRS between the teaching and non-teaching facilities within HSC.

#### Statement of the Problem

Using data acceptable to both DoD and civilian agencies, develop a methodology, that is easily replicated, for determining the cost of GME by specialty. Acuity of care must be factored into the methodology and costs must be expressed in fiscal year (FY) 93 dollars. Any assumptions must be conservative and defendable.

#### Literature Review

Success is often measured in terms of educational accomplishment, just as career satisfaction is often contingent upon available educational opportunities. Nowhere is this more

true than in the military health care arena where personal goals often include advanced education. One such educational opportunity is advanced medical education, which affords physicians opportunities for personal achievement, academic excellence, and professional prestige; and may be critical for career satisfaction and fulfillment.

The effects of a high quality medical education program are readily apparent for recruitment and retention of physicians, but the cost of such a program is not so obvious. Several studies have been undertaken to cost out GME, but none have been completely successful.

Since the 1950s, cost allocation has been the major focus of studies concerning the cost of medical education. The problem with cost allocation studies is that it is difficult to separate education from patient care and research. These activities often occur simultaneously and a "pure" cost cannot be identified.

In 1958 the Association of American Medical Colleges (AAMC) carried out a study of medical school costs that recognized the importance of determining the cost of education as an entity separate from the other outputs of a medical school (Carroll 1958). They developed and tested a system of program cost-finding procedures that utilized classical cost accounting (finding a method of allocating total institutional costs across that institution's set of final products in such a way that the sum of product costs equals total activity cost) and prepared a manual for use by medical colleges to determine the costs of its

various education, service, and research programs (Carroll 1967, 1). Classical cost accounting attempts to allocate all direct and indirect costs into patient care or training. This can be problematic in that it is often done subjectively by asking the proctors and residents how much of their time is devoted to teaching and how much to patient care.

This led to a joint study by the American Hospital Association (AHA), the American Medical Association (AMA), and the AAMC beginning in 1962 (Carroll 1962, 138). The goal was "to develop and test criteria and procedures that teaching hospitals may use to identify the cost of each of their patient-care, teaching, research, and community-service programs" (Carroll 1965, 142). The development of sound criteria for the allocation of specific expenditures to medical education or hospital care was essential so that controversial expenditure items could be identified and jointly allocated by knowledgeable medical and hospital representatives (Carroll 1962, 746). The researchers recognized that the results needed to be mutually acceptable to medical school, hospital, and other health officials (Carroll 1965, 143). The final result of this work was a method for standardizing the determination and reporting of program costs, which has been widely used since 1959 by medical schools, as well as the American Association of Dental Schools (Carroll 1967, 1).

The grant from the Kellogg Foundation that was used for this study also led to the development of an annual questionnaire used by the AAMC and the AMA to determine total expenditures of

all medical colleges, as well as the amounts and sources of the funds from which the expenditures were made. The results of a study of program costs utilizing this questionnaire in 12 medical colleges for the academic year 1958-59 indicate that the cost of training interns and residents was \$2930 per year (Carroll 1967, 1, 6).

Carroll used traditional cost accounting in order to find the cost of civilian GME. He utilized cost allocation data from the 1960s for Yale-New Haven Hospital and estimated the cost of GME to be four percent of the hospital's total expenditures (Bircher 1986, 2).

Carr and Feldstein applied multiple regression analysis to study the costs of clinical operations attributable to teaching at 3,147 U.S. voluntary short-term general hospitals in 1963. Their independent variables were number of types of internship and residency programs, number of interns and residents, and a dummy variable indicating hospital and medical school affiliation; and the dependent variable was total cost. They estimated the cost per intern and resident to be \$5,034, which included capital depreciation. Additionally, the average cost increase associated with each internship or residency program was estimated to be \$55,347 (Carr and Feldstein 1967, 55-6, 60).

Wing analyzed GME from the perspective of cost per student in 1972 by "comparing estimates of the clinical costs for a hypothetical house officer program to the medical school operating and capital costs" (Wing 1972, 41). He applied Carr

and Feldstein's cost allocation methodology and found that this "amounts to nearly \$9,300 per house officer in education-related hospital expenses" (Wing 1972, 41). Wing concluded that "costs of educating house officers incurred at teaching hospitals are apparently substantially larger than those incurred by the medical school" (Wing 1972, 43). He also states that "while hospitals and not the medical schools incur these costs, they make legitimate educational costs which should be allocated to the educational program" (Wing 1972, 41). Wing's \$9,300 estimate reflects "not only direct costs such as incurred through teaching services provided by hospital staff, but also indirect costs such as from duplicate laboratory tests" (Wing 1972, 41).

In 1971-1972 the Hartford Hospital Study was conducted by the independent auditing firm of Ernst and Ernst as commissioned by Hartford Hospital.

This study addressed the costs of medical training programs in a large medical center by comparing costs of all training programs with realistic cost estimates of replacing 'hospital essential services' performed by students with similar services performed by trained practitioners (Ernst and Ernst, 1972).

Ernst and Ernst determined "what proportion of total hospital costs would be escaped if education were abandoned while patient services were maintained at current levels by substituting full-time physicians for the displaced residents" (Freymann and Springer 1973, 65). Their approach eliminated the problem of defining quality of patient care and placing a value on it because replacement of students by competent physicians kept the quality variable constant. The problem of separating

education from service was solved by asking the question "if you were not performing the act at that time would someone else have to do it? If the answer is no, then it is education. If the answer is yes then it is service" (Freymann and Springer 1973, 66).

Freymann and Springer determined "the cost of education at Hartford Hospital in fiscal 1971 to be \$5.055 million, or 13.4 percent of the hospital's operating budget" (Freymann and Springer 1973, 66). Three categories were included in this total: (1) direct cost of allied health, nursing, and graduate medical programs, (2) cost of educational support, and (3) indirect costs. They also determined what it would cost if they had no educational programs. Findings indicated that the net cost of education was \$4.525 million, replacement cost value was \$2.8 million, and indirect costs were \$1.734 million. The difference between the costs of education and the costs still incurred if education were abolished was -\$9,000. Therefore, the conclusion was that if all educational programs had been eliminated the operating budget of Hartford Hospital would increase by \$9,000. Freymann and Springer also concluded that if 145 interns and residents were dropped the hospital would have been forced to hire 40 full time physicians, 10 nurse practitioners, and 14 surgical technicians to replace them (Freymann and Springer 1973, 66, 70).

Koehler and Slighton published work in 1973 that dealt with the problem of joint production costing, as it applied to medical

education. Although their study dealt with concepts, rather than actual data, it is a basis for theoretical concepts concerning joint production costing, as opposed to cost allocation techniques of the past. They state that "where several activities are carried on jointly - as teaching, patient service, and research are mingled in medical school - a non-arbitrary allocation of costs is impossible and classical cost accounting cannot find the "true" cost of one output" (Koehler and Slighton 1978, 532). "Under the circumstances of joint production: (1) the sum of the "pure" costs of all joint products is always less than the total activity cost while, (2) the sum of the pure and joint costs for all the products is always greater than the total activity cost" (Koehler and Slighton 1973, 539). They approach the problem of cost identification by looking at the change in total costs of running a department if medical students were eliminated from departmental activities, while other programs were held at constant output levels.

In 1973 the Wilford Hall Air Force Hospital Study was undertaken "to determine costs associated with educational programs and replacement cost of patient care provided by trainees" .

All possible direct and indirect costs were quantified, including salaries, PCS, TDY expenses, food service, overhead, equipment, etc. As could be expected, patient care costs were elusive, because care was provided by both trainees and staff, interspersed with educational and research missions. Their conclusion was that the net direct cost was only 0.91 per cent of 'total Wilford Hall funds' for FY 73 (Gould, et al. 1973).

Results indicated that "trainees are not parasitic, that they

indeed do useful work." "The point is that the training programs may well be cost effective during the 'real time' training period, as well as the major source of future career officers". They concluded that the net cost of GME at Wilford Hall was about one percent of the hospital's total FY 1973 operating costs (Gould, et al. 1973).

According to Ledford and Driskill, the Military Health Care Study (MHCS) was commissioned in 1973, by the President, with three objectives:

1. To assess the ability of the current DoD military medical programs to meet projected future needs.
2. To evaluate the current Military Health Services System (MHSS) and alternatives to it with respect to cost, quality of care, and physician requirements.
3. To recommend appropriate modifications to the MHSS.

The findings of the second objective, with respect to cost, were that the costs of increasing the size of GME programs were minimally greater than the costs of sufficient fully trained volunteer accessions to meet projected physician workload. Results also indicated that "interns and residents were 50 percent productive" (Ledford and Driskill 1976, 842).

Stern, et al. studied two prepaid and two fee-for-service Harvard Primary Care Program affiliated outpatient practices in order to determine the financial requirements of an established primary-care educational program for house officers. They found that residents provided patient services sufficient to cover only

77 percent of total program which averaged \$3190 per month. Additionally, it was determined that a senior staff internist providing the same services as a primary care resident would cost the HMO \$35 more per month (Stern, et al. 1977, 638-39).

Panton, Mushlin, and Gavett used a replacement-cost concept under different levels of patient services to study a primary-care residency training program in a hospital outpatient setting. They utilized an approach in which teaching costs are calculated, based on changes in program costs which would result from abandoning the teaching activity. Their results showed that the cost of training, which is the product, is small at full clinical utilization and is sensitive to changes in the volume of services provided. They calculated that at 100 percent utilization of time for both the residents and the replacement team, it costs \$833 per resident per year for training. At 80 percent utilization, which is more realistic, they estimate the cost to be \$475 per resident per year (Panton, Mushlin, and Gavett 1980, 668-69, 73, 74).

In 1985 Brecher and Nesbitt analyzed 18 different factors expected to influence hospital financial condition. The various factors were "related to four separate dimensions of financial condition - annual operating results, indebtedness, age of plant, and liquidity". They concluded that the factors expected to be significant generally were, but an exception was a hospital's teaching commitment . They report that "a hospital's teaching commitment does not affect its financial condition".

Additionally, "there may not be a net cost to teaching programs when the expenses of supervision are weighed against the services rendered by house staff; alternatively, any added expenses for graduate medical education may be sufficiently covered by third-party payments" (Brecher and Nesbitt 1985, 267-68, 290).

Bircher and Ziskind conducted a study of Graduate Medical Education in the Air Force in 1986 in order to compare "the costs of military and civilian teaching and non-teaching hospitals" and identify the "costs of the product differences between the two types of hospitals". They used "multiple regression analysis to identify the cost of each factor independently of the others". Results indicate that the "difference in costs per admission for teaching hospitals as compared with non-teaching hospitals is - \$2,071 minus \$1,266, or \$805" (Bircher and Ziskind 1986, 1, 4). They quoted the Commonwealth Fund's Task Force findings that "major civilian teaching hospitals in 1981 had 126 percent higher operating costs per discharged patient than did non-teaching hospitals: \$4,221 versus \$1,865" (The Commonwealth Fund 1985). "Military GME is estimated to cost approximately \$29,600 per student per year" while "military GME and research adds \$226 to the cost of an admission at a teaching hospital". Bircher and Ziskind concluded that "if we were to place an active duty physician in a civilian GME program instead of a military program, the net cost to the government would increase . . . [and] . . . the total net cost to the government to train an active duty physician at a civilian hospital would exceed \$50,000

per year". They relate that Military GME "has a positive impact on personnel . . . [and] . . . the current approach to GME is the most cost-effective to the government for active duty military physicians" (Bircher and Ziskind 1986, 8).

In 1988 the Health Care Financing Administration (HCFA) used regression analysis to estimate the magnitude of indirect graduate medical education costs and adjust teaching hospital payment rates under the Prospective Payment System (PPS). This decision was a result of the significantly higher patient care costs found in teaching hospitals, which are generally attributed to variations in practice patterns between interns and residents in teaching hospitals and attending physicians in community hospitals. The regression analysis used by HCFA did not make adjustments for case-mix and wage differences, but used econometric estimates of hospital cost functions and considered three major variables of indirect costs: regional variations in practice patterns, variations in service mix, and unmeasured variations in patient severity of illness. Findings by HCFA researchers indicated that "operating costs increased 5.79 percent for each .1 percent increase in the resident-to-bed ratio" (Thorpe 1986, 221). Because hospital size and urban city size distinctions were not included in the standardization process developed by HCFA; and use of the 5.79 percent figure to adjust for teaching differences resulted in operating losses for teaching hospitals, the original indirect teaching cost adjustment was increased to 11.59 percent. Under current law,

hospitals receive approximately a 7.7 percent add-on for each increase in the inpatient resident-to-bed ratio (Thorpe 1986, 220-21).

Thorpe questioned whether HCFA correctly used regression analysis in the establishment of reimbursement rates for hospitals under the Prospective Payment System. He conducted regression analysis and included variables of Medicare operating costs, case mix, wage index, proportions of Medicaid patients, and hospitals in areas with differing populations and locations across the nation. Through use of multivariate analysis, Thorpe found that costs in teaching hospitals rise only 3.15 percent for each .1 increment in the resident-to-bed ratio, which is significantly less than HCFA's findings or the amount currently adjusted for indirect costs (Thorpe 1986, 219, 222-23).

Custer and Wilke examined the "effect of medical staff behavior on the cost of hospital based care and graduate medical education" in 1991. Their "results indicate that there are important economies of scale and scope in hospital production, both for inpatient days and for residency training" (Custer and Wilke 1991, 831-32). They found that staff characteristics may capture aspects of the quality of inpatient care and residency training provided by the hospital and "indirect costs of medical education may include the hospital's costs of attracting and retaining high-quality physicians on its medical staff" (Custer and Wilke 1991, 847). Staff characteristics include: the presence of employed physicians, medical research, and physicians

with greater experience. Results of this study indicate that the "resident cost per case is about 5.3 percent at sample means, or 2.7 percent per 0.1 resident per bed" (Custer and Wilke 1991, 846). This calculation is in agreement with the results of work done by Thorpe in 1988 and shows that the current HCFA adjustment factor for Medicare reimbursement is two times larger than warranted (Custer and Wilke 1991, 846).

Using the average incremental costs from the specification without medical staff characteristics, resident costs per case add 4.6 percent per 0.1 resident per bed to the Medicare cost per case, somewhat below HCFA's original estimate of 5.795 (Custer and Wilke 1991, 846).

Custer and Wilke relate that "the estimated cost of residency training decreases markedly as increasing detail about the medical staff is included in the estimation". They conclude that "the cost of residency training is actually quite low" (Custer and Wilke 1991, 847).

Brooke, Hudak, and Finstuen estimated hospital costs utilizing a multivariate approach to evaluate GME program costs among clinical specialties of medicine, surgery, obstetrics and gynecology (OBGYN), orthopedics, psychiatry, and pediatrics. Three years of data from thirty-seven community and general hospitals of a nation-wide, military health care delivery system were collected. The model presented predicted cost per disposition as a function of calendar year, severity of illness, size of facility, technology of specialty, GME presence, teaching intensity, and department efficiency. GME cost data was presented by clinical specialty, teaching facility, and cost per

disposition per resident by service in each teaching facility. The researchers conducted the study in two phases (Brooke, Hudak, and Finstuen 1994).

The first phase compared full and reduced regression models to determine the amount of variance of each independent variable that exceeds each of the other independent variables in the model. The second phase used dependent variable predicted scores to estimate the costs of GME by specialty at each teaching facility. The difference between the predicted estimate per disposition for each teaching department and the mean predicted cost per case for each non-teaching department is considered the GME cost per disposition. The results of this study indicate that the estimated GME costs per disposition for orthopedics and OBGYN among military teaching hospitals comparable to those in the population studied are \$1683 and \$497 respectively. The major finding of the study was that costs of GME vary widely among specialties. Therefore, GME costs should be identified at the department level and not the facility level (Brooke, Hudak, and Finstuen 1994).

Gonyea developed a methodology known as the program cost analysis construction method, which calculates costs based on the real and reasonable resources required today to train health professional students. Gonyea's focus is on educational costs and essential and complementary activities of all educators. Key variables used in this study were: planned student input and output, required educator contact hours, activity profiles of

educators, graduate and post graduate students; salaries for educators, students' salaries and stipends, and other supporting resource cost factors. The results of this methodology applied to a sample of 126 medical schools nation wide were that undergraduate, specialty, and sub-specialty medical education cost averaged \$95,145, \$194,383, and \$288,743 per student per year respectively (Valberg and Gonyea 1993).

#### Purpose of the Study

According to the Society of Medical Consultants to the Armed Forces,

the primary mission of the Army, Navy, and Air Force medical organizations is clearly that of contingency readiness. In this era of restrained resources the Surgeon General's most pressing problem is how to balance the building and maintenance of a combat ready medical force with the peace time requirements to satisfy the health care needs of the operating forces and other entitled constituents (Society of Medical Consultants to the Armed Forces 1987, 3).

Compounding this problem of balance is the emphasis on cost containment and the reimbursement of hospitals on the basis of diagnosis-related-groups; which may limit the availability of funds necessary for employment of personnel in sufficient numbers to meet mission requirements.

This dilemma leads to the need for costing out programs and comparing these costs for effective decision making. Many attempts have been made to cost out health care services and programs, as seen in the review of the literature.

Costing out GME has proved to be difficult, due to the overlap of patient care, teaching, and research, and many

different types of analysis have been applied in attempts to solve this problem. The purpose of this study is to determine the cost of GME for orthopedic surgery and OBGYN in Army teaching hospitals, so that benchmarks may be established for future comparisons.

Further research may be completed to determine if the cost of Army GME is acceptable compared to other military and civilian programs.

## CHAPTER 2

### METHODS AND PROCEDURES

#### Workload Based Comparisons

From the beginning of the study it was accepted that comparable levels of workload by specialty would be used to determine which teaching and non-teaching facilities could be compared. The basic assumption was that the difference between teaching and non-teaching facility's total measured MEPRS expenses, by specialty, is due to GME. The specialties chosen for this study were orthopedics and OBGYN based on their narrowly focused rotations, making them different than specialties like internal medicine or general surgery with a broader focus. Residents in the latter programs incur expenses in a number of departments outside their area of focus. It is important to note a primary difference between orthopedics and OBGYN residencies. Orthopedics is a specialty program that accepts residents who have completed either general surgery categorical or transitional internships; while OBGYN has a categorical internship of its own. The impact of this difference on this study will be explained in the discussion section.

The MEPRS database provided expense, manpower, and performance information by third level MEPRS accounting codes for all 38 HSC facilities. Due to incomplete FY93 data, FY92 data

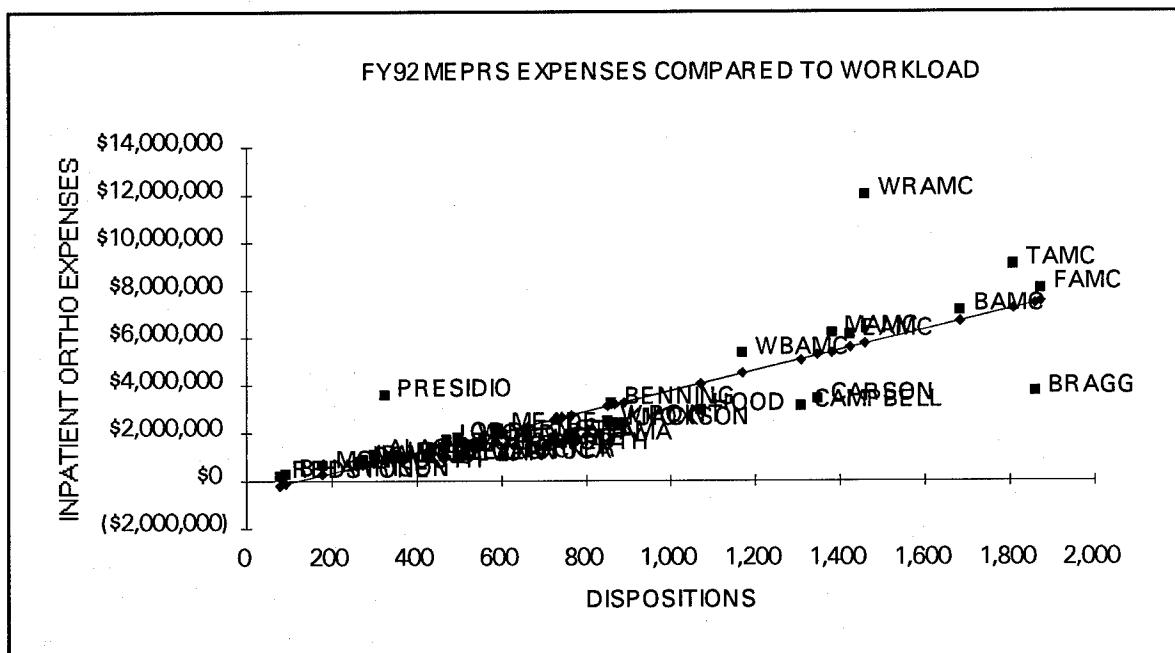
was utilized and adjusted by the FY93 medical consumer price index of 5.95 percent. Inpatient care, outpatient care, ancillary services, and support services information for all orthopedics and OBGYN departments was extracted from MEPRS. For the purpose of this study, MEPRS has one limitation in that GME costs associated with student travel, clinical investigation, and 50 percent of student salaries, for all second year students and greater, are not allocated back to the cost centers, but are instead held in a special account. This limitation was discovered after the initial methodology was applied to the orthopedic residency program. Manual allocation was done to account for clinical investigation costs and residents' salaries for the OBGYN residency program. However, no reasonable method of allocating the remaining GME costs within the special accounts could be developed based on resource limitations of the researcher. The following methodology was applied to the orthopedic residency program. The modification discussed for clinical investigation costs and residents' salaries was applied only to OBGYN and will be discussed later.

Orthopedics inpatient workload data indicating the number of dispositions (DISP), the number of relative weighted products (RWPS), and the number of beddays are listed with expenses in Appendix 1, page 62. Inpatient work units (IWU), another workload measurement, was calculated by multiplying the number of dispositions by the relative case mix index (RCMI). Outpatient workload data indicating the number of clinic visits and

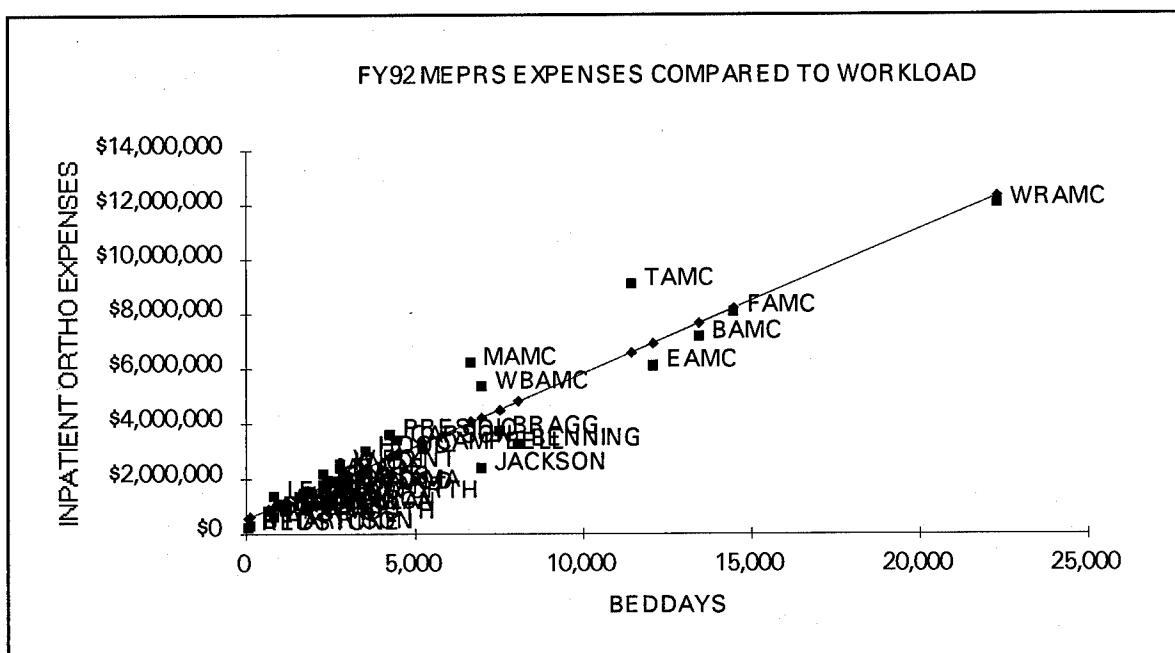
ambulatory work units are indicated with their expenses and are listed in Appendix 2, page 63.

Expenses and workload data from the Fort Dix Medical Activity (MEDDAC) were deleted in all cases due to its preparation for closure as a Base Realignment and Closure (BRAC) site. Inpatient expenses for the Fort Drum MEDDAC are also deleted because there is no inpatient facility associated with this medical activity.

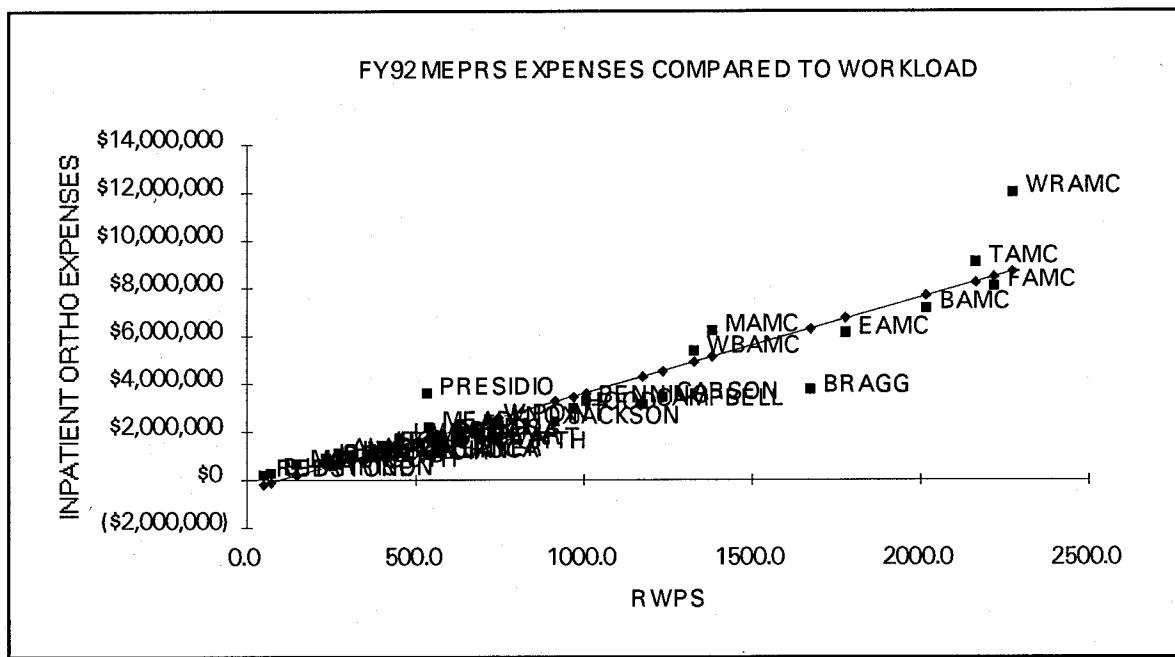
Each measure of workload is graphed in comparison to its expenses. Orthopedic dispositions are shown in Figure 2, beddays are shown in Figure 3, RWPS are shown in Figure 4, and IWUs are shown in Figure 5.



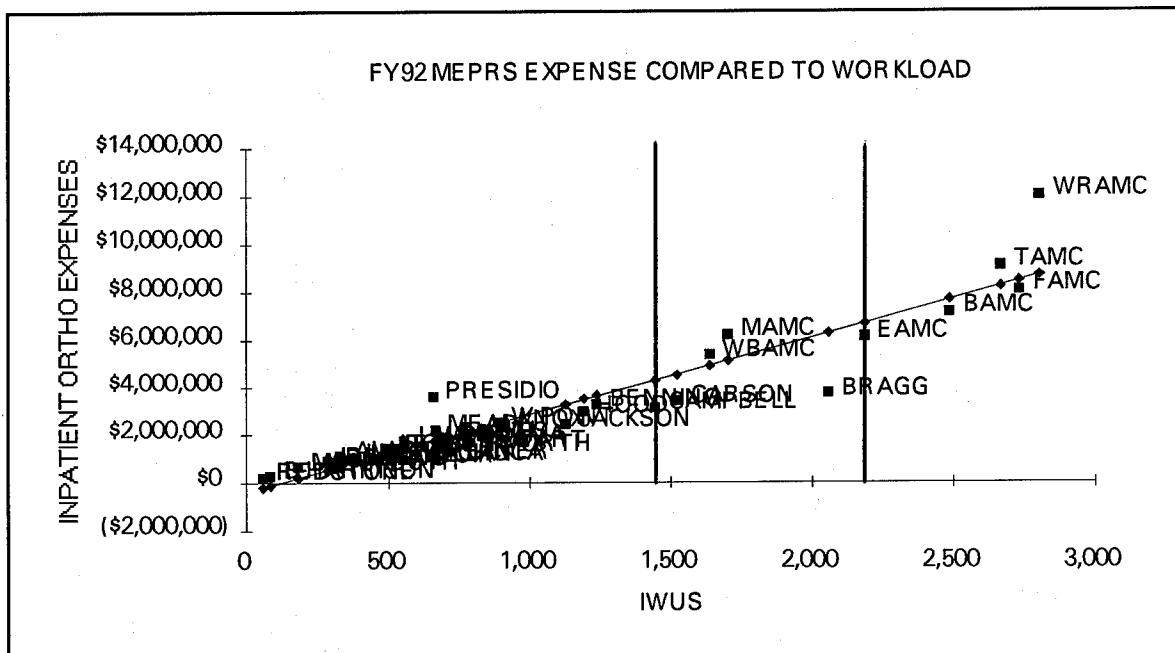
**Figure 2.** Inpatient Expenses Compared to Orthopedic Dispositions. (MEPRS 1993).



**Figure 3.** Inpatient Expenses Compared to Orthopedic Beddays.  
(MEPRS 1993).



**Figure 4.** Inpatient Expenses Compared to Orthopedic RWPS.  
(MEPRS 1993).



**Figure 5.** Inpatient Expenses Compared to Orthopedic IWUS.  
(MEPRS 1993).

Since dispositions and beddays provide no measure of acuity, they were not used to measure workload when comparing teaching and non-teaching facilities. The graph indicating RWPS and IWUs both offer a measure of acuity. Comparing these graphs, the cost and workload intersection point of each facility is identical on each graph. The only difference between the two graphs is the scale for the measure of workload. The RWPS scale ranges from 0-2500 while the IWU scale ranged from 0-3000.

Workload measured as IWUs was used to compare teaching and non-teaching facilities. Instead of using only one teaching facility compared to one non-teaching facility, it was concluded that more accurate results would be obtained if more facilities

were compared. Figure 5 indicates that workload for orthopedic teaching facilities (Eisenhower Army Medical Center (EAMC), Madigan Army Medical Center (MAMC), and William Beaumont Army Medical Center (WBAMC)) is relatively comparable in quantity and acuity to workload at non-teaching facilities (Fort Bragg MEDDAC, Fort Carson MEDDAC, and Fort Campbell MEDDAC).

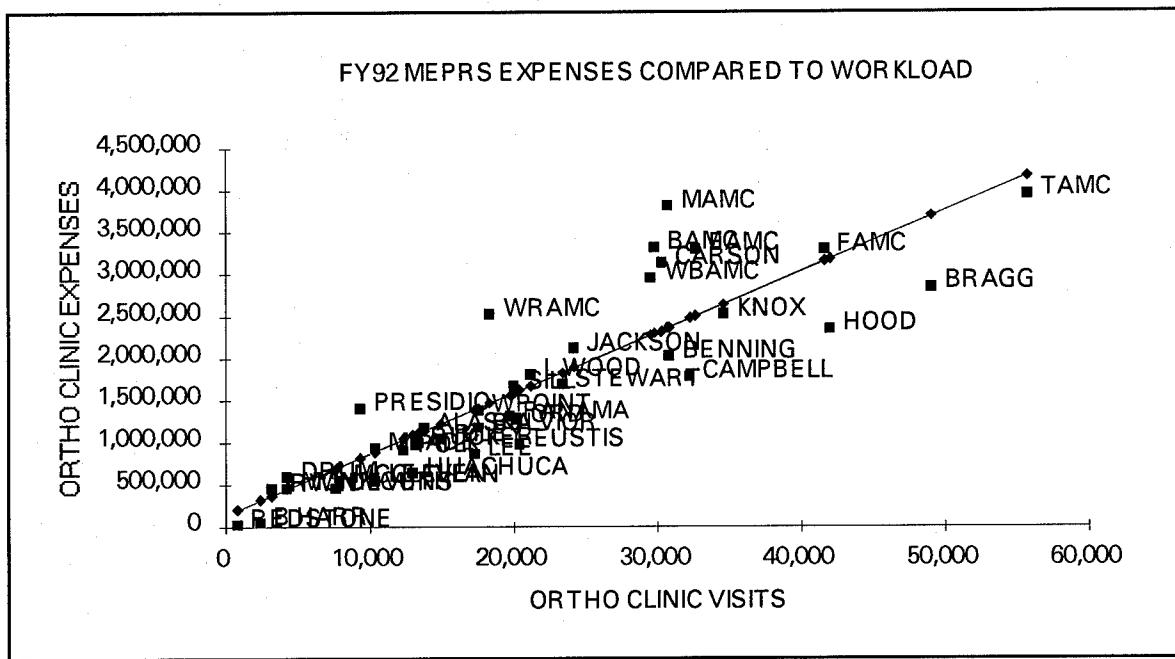
Outpatient data obtained from the MED302 report was very limited in detail for patient encounters. This data was downloaded into MEPRS and combined with expenses to provide the outpatient data utilized in this study. Any MEPRS sub-accounts listed under the base accounts of orthopedics or OBGYN that had no GME involvement was excluded from the study. This insured that any differences between teaching and non-teaching department expenses were not due to the cost of GME. The accounts utilized for the orthopedics and OBGYN residency are depicted in Table 1. The ability to combine outpatient and inpatient workload into a single measure of workload for each facility is possible and is considered a standard measure in DoD known as medical work units (MWUs). However, the use of MWUs to compare workload presents a problem when examining acuity later in the methodology. To overcome this problem and provide the most accurate results based on available data, it was determined that the IWU would be the best measurement for workload and acuity compared to expenses. Additionally, the majority of resources were expended in the inpatient MEPRS accounts.

**Table 1.--MEPRS Accounts Utilized for Orthopedics and OBGYN**

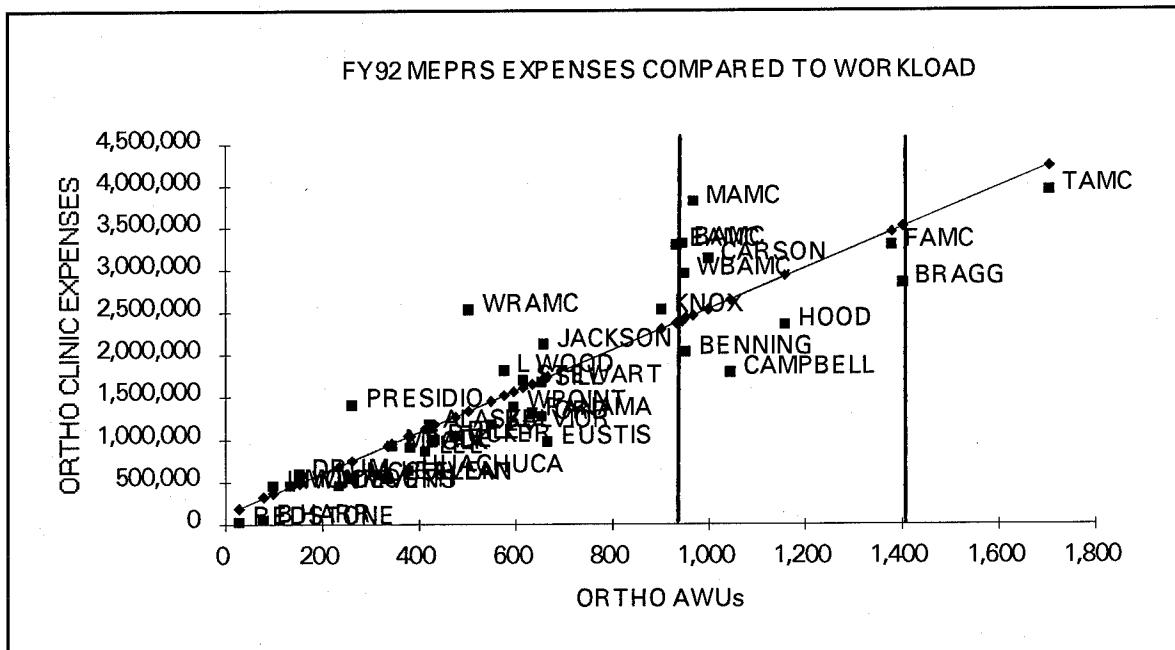
| MEPRS Code | Accounts  | Included | Excluded |
|------------|---|----------|----------|
|            | Orthopedic Inpatient                                    |          |          |
| AEA        | Orthopedics   | X        |          |
| AEB        | Podiatry  |          | X        |
| AEC        | Hand Surgery  | X        |          |
| AEX        | Cost Pools  | X        |          |
|            | Orthopedic Outpatient                                   |          |          |
| BEA        | Orthopedic Clinic                                       | X        |          |
| BEB        | Cast Clinic   | X        |          |
| BEC        | Hand Surgery Clinic                                     | X        |          |
| BED        | Neuromusculoskeletal Screening Clinic                   | X        |          |
| BEE        | Orthopedic Appliance Clinic                             | X        |          |
| BEF        | Podiatry Clinic   |          | X        |
| BEX        | Cost Pools  | X        |          |
| BEZ        | Accounts Not Otherwise Classified                       | X        |          |
|            | OBGYN Inpatient   |          |          |
| ACA        | Gynecology  | X        |          |
| ACB        | Obstetrics  | X        |          |
| ACX        | Cost Pools  | X        |          |
|            | OBGYN Outpatient  |          |          |
| BCA        | Family Planning Clinic                                  |          | X        |
| BCB        | Gynecology Clinic                                       | X        |          |
| BCC        | Obstetrics Clinic                                       | X        |          |
| BCX        | Cost Pools  | X        |          |
| Note:      | Accounts excluded from the study<br>have no GME impact. |          |          |

Figures 6 and 7 provide a graphic representation of the outpatient workload measurements compared to orthopedic outpatient expenses. Applying the same methodology used with the inpatient expenses, and comparing facilities based on the AWU variable (Figure 7), it is apparent that the same teaching facilities and non-teaching facilities have comparable workload with the exception of the Fort Bragg MEDDAC. Additionally, Brooke Army Medical Center (BAMC) has comparable outpatient

workload as a teaching facility, while Fort Knox and Fort Hood MEDDACs have comparable outpatient data as non-teaching facilities. Since IWUs were used as the sole variable for facility comparison, these differences were noted, but required no adjustments.



**Figure 6.** Outpatient Expenses Compared to Orthopedic Clinic Visits. (MEPRS 1993).



**Figure 7.** Outpatient Expenses Compared to Orthopedic AWUS. (MEPRS 1993).

Expense data from Appendices 1 and 2 for MAMC, EAMC, and WBAMC were extracted and totalled to determine the total inpatient and outpatient orthopedic expenses among the three (Table 2). The same was accomplished for the three MEDDACS: Fort Bragg, Ft. Carson, and Fort Campbell. The total of the three non-teaching facility's inpatient expenses was subtracted from the total teaching facility's inpatient expenses, thus deriving the total annual cost of orthopedic GME for inpatient accounts. The same procedure was accomplished for outpatient expenses. The assigned number of orthopedic residents for each of the teaching facilities was also identified and totalled, as was dispositions.

**Table 2.--Orthopedic GME Cost Without Acuity Adjustment**

|  | INPATIENT<br>EXPENSES  | ADJUSTED<br>IP EXPENSES | ORTHO<br>RESIDENTS | DISP             | RCMI         | IWUS  |
|--|------------------------|-------------------------|--------------------|------------------|--------------|-------|
| MAMC   | \$6,222,544            | \$6,592,785             | 14                 | 1.381            | 1.2341       | 1.704 |
| EAMC   | \$6,115,510            | \$6,479,383             | 8                  | 1.423            | 1.5365       | 2.186 |
| WBAMC  | \$5,343,098            | \$5,661,012             | 20                 | 1.169            | 1.3985       | 1.635 |
| Total cost for teaching facilities   | \$17,681,152           | \$18,733,181            | 42                 | 3.973            | 1.3897       | 1.842 |
| Teaching facility cost per disposition   |                        | \$4,715                 |                    |                  |              |       |
| Fort Bragg   | \$3,704,119            | \$3,924,514             | 0                  | 1.860            | 1.1072       | 2.059 |
| Fort Carson  | \$3,392,594            | \$3,594,453             | 0                  | 1.348            | 1.1301       | 1.523 |
| Fort Campbell  | \$3,146,369            | \$3,333,578             | 0                  | 1.307            | 1.1062       | 1.446 |
| Total cost for non-teaching facilities   | \$10,243,082           | \$10,852,545            | 0                  | 4.515            | 1.1145       | 1.676 |
| Non-teaching facility cost per disposition                                     |                        | \$2,404                 |                    |                  |              |       |
| Cost per Orthopedic GME disposition  |                        | \$2,311                 |                    |                  |              |       |
| Cost per GME disposition per resident  |                        | \$55                    |                    |                  |              |       |
| Annual cost of orthopedic GME (Inpatient)                                      | \$7,438,070            | \$7,880,635             |                    |                  |              |       |
| Average annual cost per orthopedic resident (Inpatient)                        | \$177,097              | \$187,634               |                    |                  |              |       |
|  | OUTPATIENT<br>EXPENSES | ADJUSTED<br>OP EXPENSES | ORTHO<br>RESIDENTS | CLINIC<br>VISITS | TOTAL<br>AWU |       |
| MAMC   | \$3,808,667            | \$4,035,283             | 14                 | 30,728           | 967          |       |
| EAMC   | \$3,298,151            | \$3,494,391             | 8                  | 32,648           | 932          |       |
| WBAMC  | \$2,958,802            | \$3,134,851             | 20                 | 29,554           | 947          |       |
| Total cost for teaching facilities   | \$10,065,620           | \$10,664,524            | 42                 | 92,930           | 2,846        |       |
| Teaching facility cost per clinic visit  |                        | \$115                   |                    |                  |              |       |
| Fort Bragg   | \$2,847,688            | \$3,017,125             | 0                  | 49,099           | 1,400        |       |
| Fort Carson  | \$3,133,858            | \$3,320,323             | 0                  | 30,283           | 997          |       |
| Fort Campbell  | \$1,789,726            | \$1,896,215             | 0                  | 32,192           | 1,044        |       |
| Total cost for non-teaching facilities   | \$7,771,272            | \$8,233,663             | 0                  | 111,574          | 3,441        |       |
| Non-teaching facility cost per clinic visit                                    |                        | \$74                    |                    |                  |              |       |
| Cost per orthopedic GME clinic visit   |                        | \$41                    |                    |                  |              |       |
| Annual cost of orthopedic GME (Outpatient)                                     | \$2,294,348            | \$2,430,862             |                    |                  |              |       |
| Average annual cost per orthopedic resident (Outpatient)                       | \$54,627               | \$57,878                |                    |                  |              |       |
| Combined inpatient/outpatient average<br>cost per orthopedic resident per year | \$231,724              | \$245,512               |                    |                  |              |       |

### Acuity Adjustments

To ensure that costs associated with acuity were considered the average RCMI was calculated for the teaching and non-teaching facilities and compared. It was determined that an average difference in acuity of .28 existed between the teaching and non-teaching facilities.

To identify the costs associated with this difference and separate it from the costs associated with GME, all of the orthopedic diagnosis related groups (DRGs) for the facilities being compared were extracted from the patient accounting and biostatistics (PASBA 2) database. One hundred and eighty-one orthopedic DRGs were identified and sorted by DRG number. RWPs associated with each DRG were totalled by named facility and by teaching or non-teaching facility. The total orthopedic inpatient expenses for each facility were divided by the total RWPs of each facility to determine an average cost per RWP by facility. The average cost per RWP by facility was then multiplied by the RWPs of each DRG of the same facility. The resultant product of each MEDCEN was totalled, as well as the resultant product of each MEDDAC. The sum total of the MEDDAC was subtracted from the sum total of the MEDCEN to derive the difference in the cost by DRG. The sum of the differences represents the difference in orthopedic expenses between the teaching and non-teaching facilities. This adjustment was subtracted from the total inpatient cost for teaching facilities in order to derive a new cost for teaching facilities. This

represents a decrement to account for the increased expenses incurred based on acuity. The adjustment and new figures are reflected in Table 3.

**Table 3.--Orthopedic GME Cost With Acuity Adjustment**

|   | INPATIENT EXPENSES  | ADJUSTED IP EXPENSES | ORTHO RESIDENTS | DISP          | RCMI      | MWUS   |
|---|---------------------|----------------------|-----------------|---------------|-----------|--------|
| MAMC  | \$6,222,544         | \$6,592,785          | 14              | 1,381         | 1.2341    | 1,704  |
| EAMC  | \$6,115,510         | \$6,479,383          | 8               | 1,423         | 1.5365    | 2,186  |
| WBAMC   | \$5,343,098         | \$5,661,012          | 20              | 1,169         | 1.3985    | 1,635  |
| Adjustment for acuity   | (\$1,192,694)       | (\$1,263,659)        |                 |               |           |        |
| Total cost for teaching facilities  | \$16,488,458        | \$17,469,521         | 42              | 3,973         | 1.3897    | 1,842  |
| Teaching facility cost per disposition                                      |                     |                      | \$4,397         |               |           |        |
| Fort Bragg  | \$3,704,119         | \$3,924,514          | 0               | 1,860         | 1.1072    | 2,059  |
| Fort Carson   | \$3,392,594         | \$3,594,453          | 0               | 1,348         | 1.1301    | 1,523  |
| Fort Campbell   | \$3,146,369         | \$3,333,578          | 0               | 1,307         | 1.1062    | 1,446  |
| Total cost for non-teaching facilities                                      | \$10,243,082        | \$10,852,545         | 0               | 4,515         | 1.1145    | 1,676  |
| Non-teaching facility cost per disposition                                  |                     | \$2,404              |                 |               |           |        |
| Cost per orthopedic GME disposition   |                     | \$1,993              |                 |               |           |        |
| Difference in teaching and non-teaching average RCMI                        |                     |                      |                 |               |           | 0.2752 |
| Cost per GME disposition per resident                                       |                     | \$47                 |                 |               |           |        |
| Annual cost of orthopedic GME (Inpatient)                                   | \$6,245,376         | \$6,616,976          |                 |               |           |        |
| Average annual cost per orthopedic resident (Inpatient)                     | \$148,699           | \$157,547            |                 |               |           |        |
|   | OUTPATIENT EXPENSES | ADJUSTED OP EXPENSES | ORTHO RESIDENTS | CLINIC VISITS | TOTAL AWU |        |
| MAMC  | \$3,808,667         | \$4,035,283          | 14              | 30,728        | 967       |        |
| EAMC  | \$3,298,151         | \$3,494,391          | 8               | 32,648        | 832       |        |
| WBAMC   | \$2,958,802         | \$3,134,851          | 20              | 29,554        | 947       |        |
| Total cost for teaching facilities  | \$10,065,620        | \$10,664,524         | 42              | 92,930        | 2,846     |        |
| Teaching facility cost per clinic visit                                     |                     | \$115                |                 |               |           |        |
| Fort Bragg  | \$2,847,688         | \$3,017,125          | 0               | 49,099        | 1,400     |        |
| Fort Carson   | \$3,133,858         | \$3,320,323          | 0               | 30,283        | 997       |        |
| Fort Campbell   | \$1,789,726         | \$1,896,215          | 0               | 32,192        | 1,044     |        |
| Total cost for non-teaching facilities                                      | \$7,771,272         | \$8,233,663          | 0               | 111,574       | 3,441     |        |
| Non-teaching facility cost per clinic visit                                 |                     | \$74                 |                 |               |           |        |
| Cost per orthopedic GME clinic visit  |                     | \$41                 |                 |               |           |        |
| Annual cost of orthopedic GME (Outpatient)                                  | \$2,294,348         | \$2,430,862          |                 |               |           |        |
| Average annual cost per orthopedic resident (Outpatient)                    | \$54,627            | \$57,878             |                 |               |           |        |
| Combined inpatient/outpatient average cost per orthopedic resident per year | \$203,327           | \$215,425            |                 |               |           |        |

This method of examining acuity could not be applied to the outpatient AWU because unlike DRGs, CPT 4 codes are not captured in the MEPRS database, therefore they could not be compared. This deficit of information prevents the use of MWUs as a single measure of inpatient and outpatient workload, as mentioned earlier.

An average cost per facility RWP was established for each DRG. A list of DRGs was examined to identify those common to both teaching and non-teaching facilities. It was assumed that

any DRG common to both a teaching and a non-teaching facility was due to GME; whereas the remaining DRGs and their associated costs were due to acuity and were subtracted from the previously derived cost of GME in Table 3. This step identified 121 common DRGs representing \$6.2 million of GME cost. The remaining 60 DRGs represent \$1.2 million attributable to increased acuity.

#### Costs Analysis

With acuity costs removed, the remaining orthopedic expenses were considered to be due to GME. At this point, all expenses were adjusted from FY92 actual dollars to FY93 dollars, by multiplying by the medical consumer price index. The FY93 adjusted inpatient expenses for GME were then divided by the total orthopedic dispositions of the three teaching facilities to get an average orthopedic cost per teaching facility disposition. The same was accomplished for the non-teaching facilities, deriving an average orthopedic cost per MEDDAC disposition, with the difference being the cost per orthopedic GME disposition. The average cost per orthopedic GME clinic visit was derived in the same fashion. Additionally, the cost per GME disposition was divided by the total number of orthopedic residents, among the three teaching facilities, to determine the cost per GME disposition per resident. Combining the annual inpatient and outpatient GME cost per resident provides the annual GME cost per orthopedic resident, thus accomplishing the purpose of this study.

### Methodology Adjustment

When determining the OBGYN cost per resident, clinical investigation costs were allocated from the special MEPRS account using a model of resource consumption developed by the Clinical Investigation Program Division of the AMEDD Center and School. This was accomplished after discovering that the GME costs in the special accounts by MEPRS were not allocated back to the inpatient or outpatient accounts, as were the ancillary and support services accounts.

The clinical investigation model of resource consumption lists a resource weight for each residency and fellowship program. The number of residents, by specialty, was multiplied by this resource weight to get a point total. The point totals of each residency program were then summed to determine the total for all residency programs. To derive the cost by residency program, the proportion of specialty program points, in relation to the total, was multiplied against the clinical investigation expenses obtained from the MEPRS special account by facility. At this point, this figure was added to the inpatient expenses for the same specialty. Table 4 indicates the amount of clinical investigation expenses that were manually allocated back to the OBGYN departments of the teaching facilities.

**Table 4.--Clinical Investigation Expenses Allocated to OBGYN**

| Resource Weight | OBGYN Residents | Specialty Points | Facility Points | Specialty Percentage | Total CI Expenses | OBGYN Expenses |
|-----------------|-----------------|------------------|-----------------|----------------------|-------------------|----------------|
| WRAMC           | 2               | 12               | 24              | 581                  | 4.13%             | \$9,600,000    |
| FAMC            | 2               | 10               | 20              | 234                  | 8.55%             | \$2,790,000    |
| WBAMC           | 2               | 12               | 24              | 209                  | 11.48%            | \$1,640,000    |
| TAMC            | 2               | 14               | 28              | 303                  | 9.24%             | \$1,700,000    |
| BAMC            | 2               | 12               | 24              | 453                  | 5.30%             | \$1,790,000    |
| MAMC            | 2               | 16               | 32              | 413                  | 7.75%             | \$1,160,000    |
|                 |                 |                  |                 |                      |                   | \$89,879       |

Manual allocation of the residents' salaries was accomplished by first, determining the average salary for all captains and majors from the FY92 Army composite standard pay rates. Then 50 percent of the salary was applied to the inpatient OBGYN MEPRS expenses for each resident. Determining the actual pay grade for each OBGYN resident at each teaching facility was not possible, therefore an assumption was made that the majority of all residents are either captains or majors.

**Table 5.--Residents' Salaries Allocated to OBGYN**

|       | AVERAGE<br>03/04 SALARY | OBGYN<br>RESIDENTS | ESTIMATED<br>OBGYN SALARIES |
|-------|-------------------------|--------------------|-----------------------------|
| MAMC  | \$37,791                | 16                 | \$604,656                   |
| TAMC  | \$37,791                | 14                 | \$529,074                   |
| WRAMC | \$37,791                | 12                 | \$453,492                   |
| BAMC  | \$37,791                | 12                 | \$453,492                   |
| WBAMC | \$37,791                | 12                 | \$453,492                   |
| FAMC  | \$37,791                | 10                 | \$377,910                   |

Table 5 illustrates how \$37,791, representing 50 percent of the average salary of a captain and major, was multiplied by the number of OBGYN residents at each teaching facility during FY92. The estimated clinical investigation expenses and OBGYN salaries

were added to the total expenses for OBGYN inpatient data shown in Appendix 3, page 64. At this point, the methodology described for orthopedics was applied.

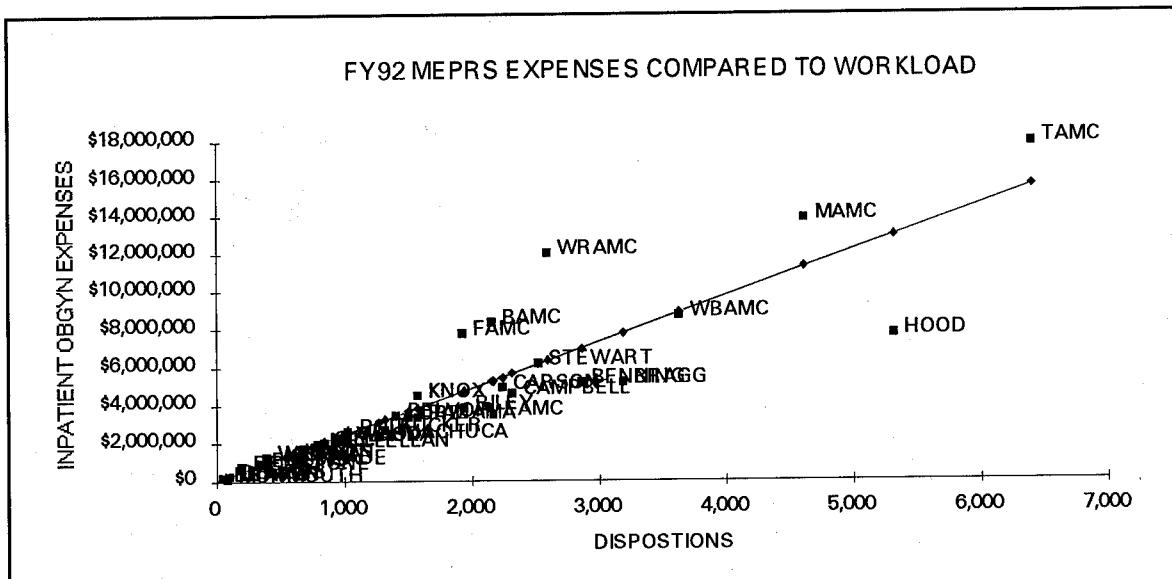
This methodology was presented to a group of subject matter experts on two occasions during the developmental process. Other than concerns about the accuracy of MEPRS data, which for the purpose of this study was assumed to be accurate, the methodology was generally agreed upon to be reasonable, logical and of an acceptable level of accuracy.

## CHAPTER 3

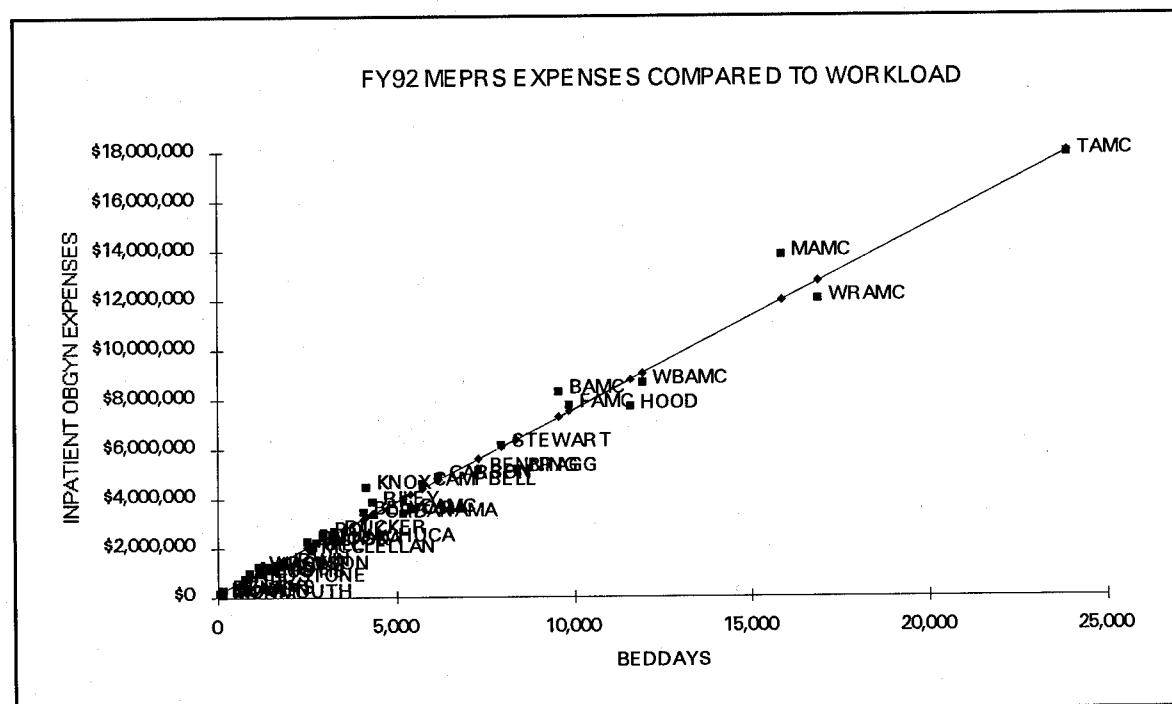
### RESULTS

GME costs for residents in narrowly focused residency programs with little overlap into other specialty areas, such as orthopedics and OBGYN, can be closely estimated utilizing this methodology, if workload in teaching and non-teaching facilities is comparable. However, preliminary analysis of a program such as general surgery revealed that the expenses captured in MEPRS may be inflated due to overlap into workcenters outside the department of general surgery. Additionally, expenses incurred by other interns, residents, and fellows that rotate through the general surgery services add to this inflation. This phenomenon may also occur in internal medicine residency programs.

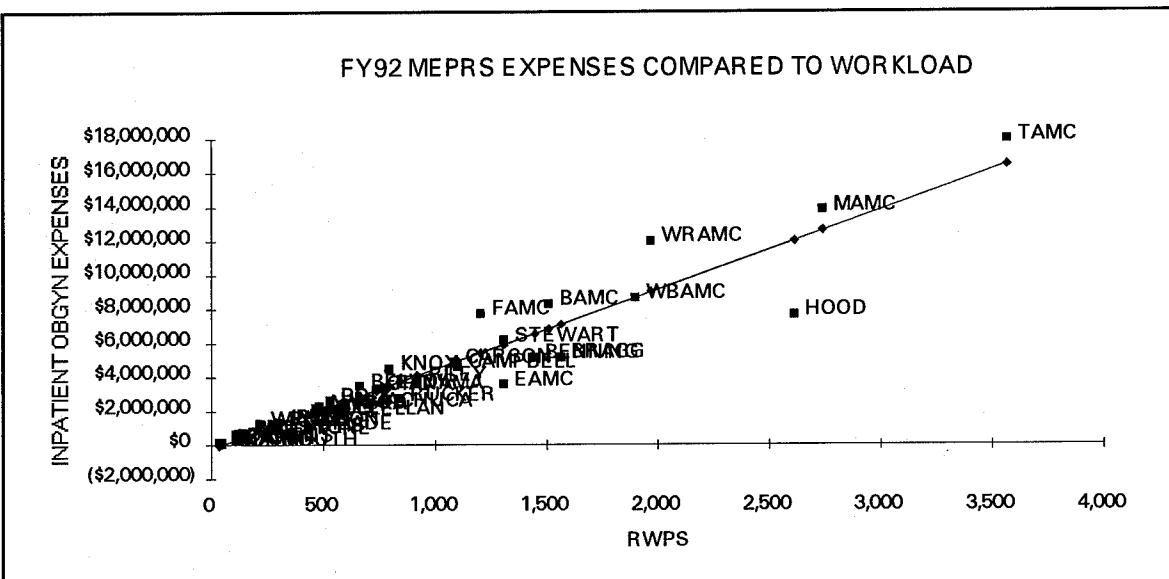
Applying this methodology to OBGYN revealed that workload at Brooke Army Medical Center (BAMC) and Fitzsimons Army Medical Center (FAMC), both teaching facilities, are comparable with the workload of Fort Bragg Medical Activity and Fort Stewart Medical Activity, non-teaching facilities. Figures 8-13 provide a view of the relationship between the various categories of inpatient and outpatient OBGYN workload and expenses. OBGYN IWUs, depicted in Figure 11, for the teaching facilities listed above, all fell within 441 IWUs; while the IWUs for orthopedic programs fell within 740 IWUs, as shown in Figure 5, page 33.



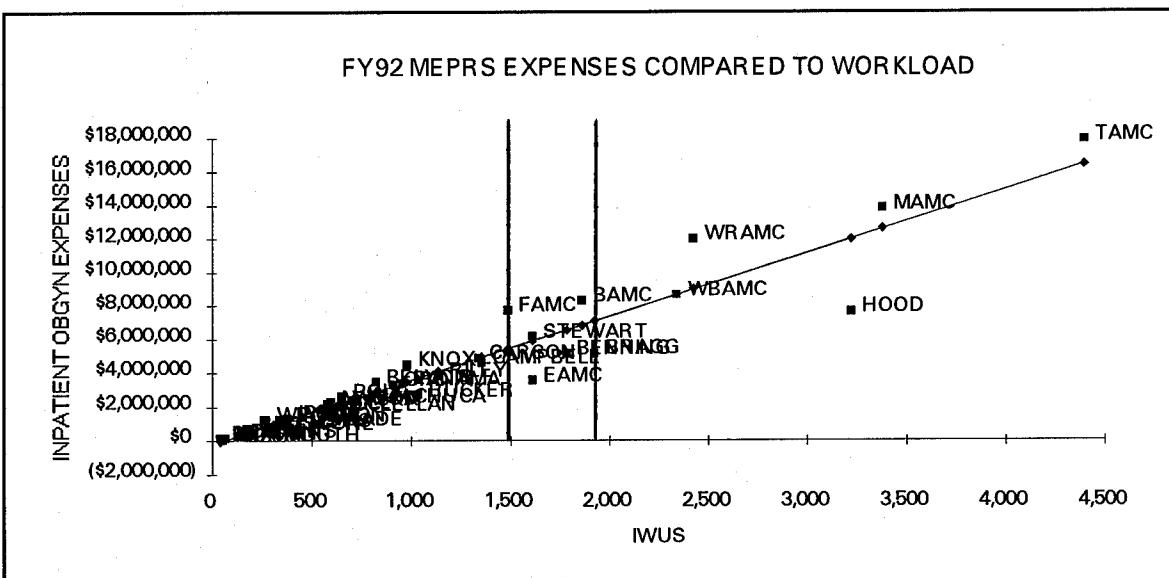
**Figure 8.** Inpatient Expenses Compared to OBGYN Dispositions.  
(MEPRS 1993).



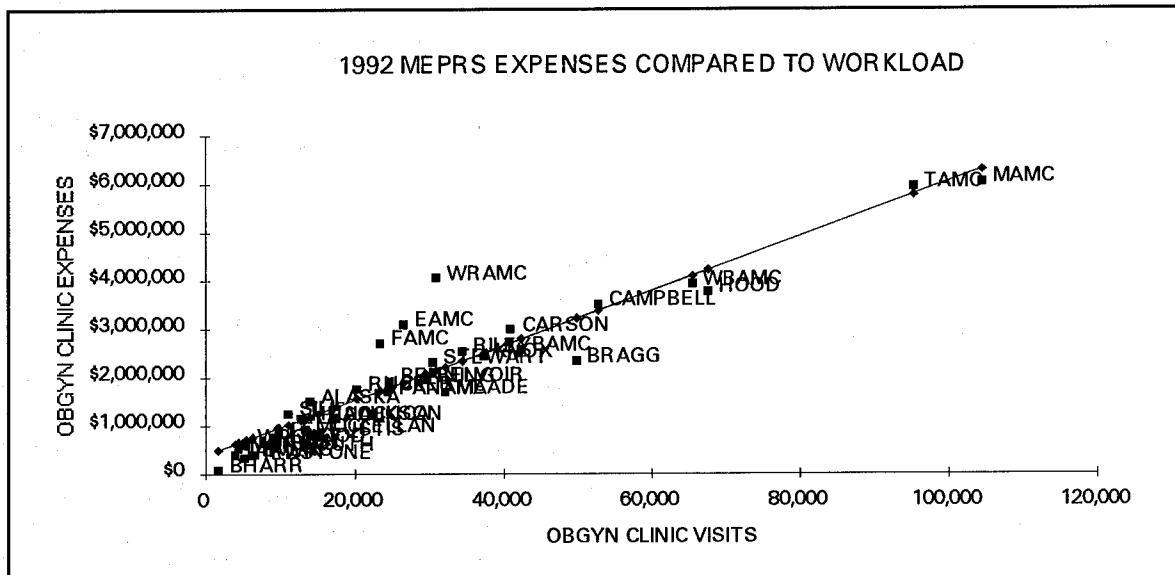
**Figure 9.** Inpatient Expenses Compared to OBGYN Beddays. (MEPRS 1993).



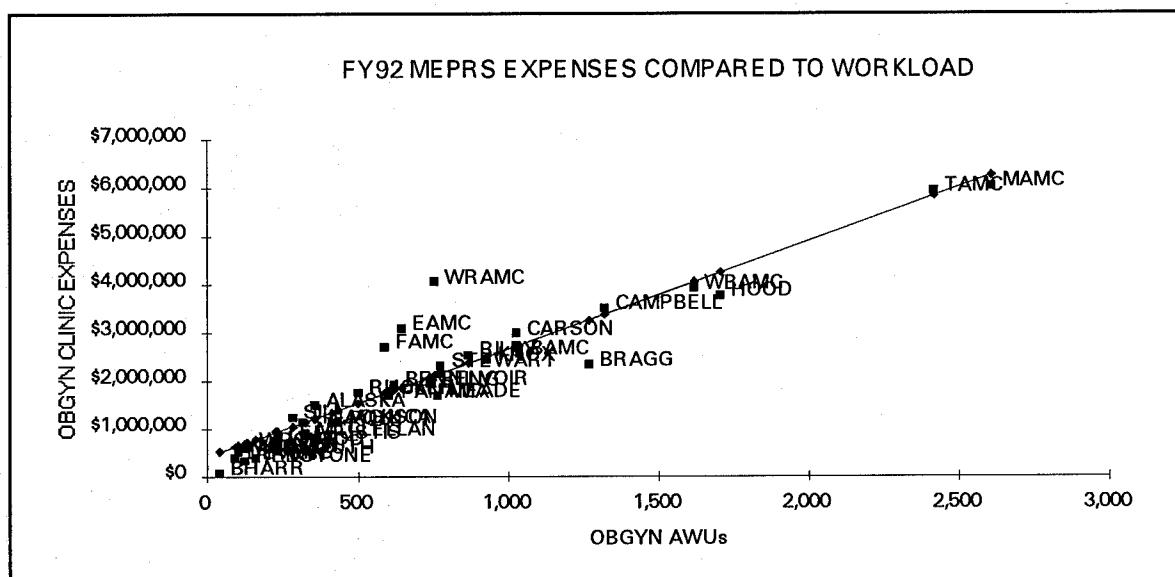
**Figure 10.** Inpatient Expenses Compared to OBGYN RWPS.  
(MEPRS 1993).



**Figure 11.** Inpatient Expenses Compared to OBGYN IWUS.  
(MEPRS 1993).



**Figure 12.** Outpatient Expenses Compared to OBGYN Clinic Visits. (MEPRS 1993).



**Figure 13.** Outpatient Expenses Compared to OBGYN AWUS. (MEPRS 1993).

Expense data, extracted from Appendices 3 and 4, was utilized to develop Table 6, detailing the figures for the OBGYN facilities that were derived from the methodology before adjusting for acuity.

**Table 6.--OBGYN GME Cost Without Acuity Adjustment**

|   | INPATIENT EXPENSES  | ADJUSTED IP EXPENSES | OBGYN INTERN/RESIDENTS | DISP         | RCMI   | AMUS   |
|---|---------------------|----------------------|------------------------|--------------|--------|--------|
| BAMC  | \$8,320,403         | \$8,814,467          | 17                     | 2,151        | 1.3270 | 2,854  |
| FAMC  | \$7,752,836         | \$8,214,130          | 10                     | 1,920        | 1.3262 | 2,546  |
| Total cost for teaching facilities  | \$16,073,239        | \$17,029,597         | 27                     | 4,071        | 1.2987 | 5,401  |
| Teaching facility cost per disposition  |                     |                      |                        | \$4,183      |        |        |
| Fort Bragg  | \$5,181,990         | \$5,490,318          | 0                      | 3,183        | 0.8652 | 2,722  |
| Fort Stewart  | \$6,158,032         | \$6,524,435          | 0                      | 2,517        | 0.8973 | 2,258  |
| Total cost for non-teaching facilities  | \$11,340,022        | \$12,014,753         | 0                      | 5,700        | 0.8677 | 4,581  |
| Non-teaching facility cost per disposition                                    |                     |                      |                        | \$2,108      |        |        |
| Cost per GME disposition  |                     |                      |                        | \$2,075      |        |        |
| Difference in teaching and non-teaching average RCMI                          |                     |                      |                        |              |        | 0.4310 |
| Cost per GME disposition per intern/resident                                  |                     |                      |                        | \$77         |        |        |
| Annual cost of OBGYN GME (Inpatient)  | \$4,733,217         | \$5,014,843          |                        |              |        |        |
| Average annual cost per OBGYN intern/resident (Inpatient)                     | \$175,304           | \$185,735            |                        |              |        |        |
|   | OUTPATIENT EXPENSES | ADJUSTED OP EXPENSES | OBGYN INTERN/RESIDENTS | TOTAL VISITS | AMUS   |        |
| BAMC  | \$2,570,997         | \$2,723,971          | 17                     | 102,260      | 3,540  |        |
| FAMC  | \$2,707,852         | \$2,869,075          | 10                     | 63,582       | 2,212  |        |
| Total cost for teaching facilities  | \$5,278,949         | \$5,593,046          | 27                     | 165,842      | 5,752  |        |
| Teaching facility cost per clinic visit                                       |                     |                      |                        | \$34         |        |        |
| Fort Bragg  | \$2,334,256         | \$2,473,144          | 0                      | 48,177       | 1,624  |        |
| Fort Stewart  | \$2,320,797         | \$2,458,884          | 0                      | 29,356       | 094    |        |
| Total cost for non-teaching facilities  | \$4,655,053         | \$4,932,029          | 0                      | 77,533       | 2,618  |        |
| Non-teaching facility cost per clinic visit                                   |                     |                      |                        | \$64         |        |        |
| Cost per GME clinic visit   |                     |                      |                        | (\$30)       |        |        |
| Annual cost of OBGYN GME (Outpatient)   | \$623,896           | \$661,018            |                        |              |        |        |
| Average annual cost per OBGYN intern/resident (Outpatient)                    | \$23,107            | \$24,482             |                        |              |        |        |
| Combined inpatient/outpatient average cost per OBGYN intern/resident per year | \$198,412           | \$210,217            |                        |              |        |        |

Note the difference in average acuity of .43 RCMI between the teaching and non-teaching OBGYN services compared. An adjustment of \$740,934 was made for this difference, and the revised costs are shown in Table 7.

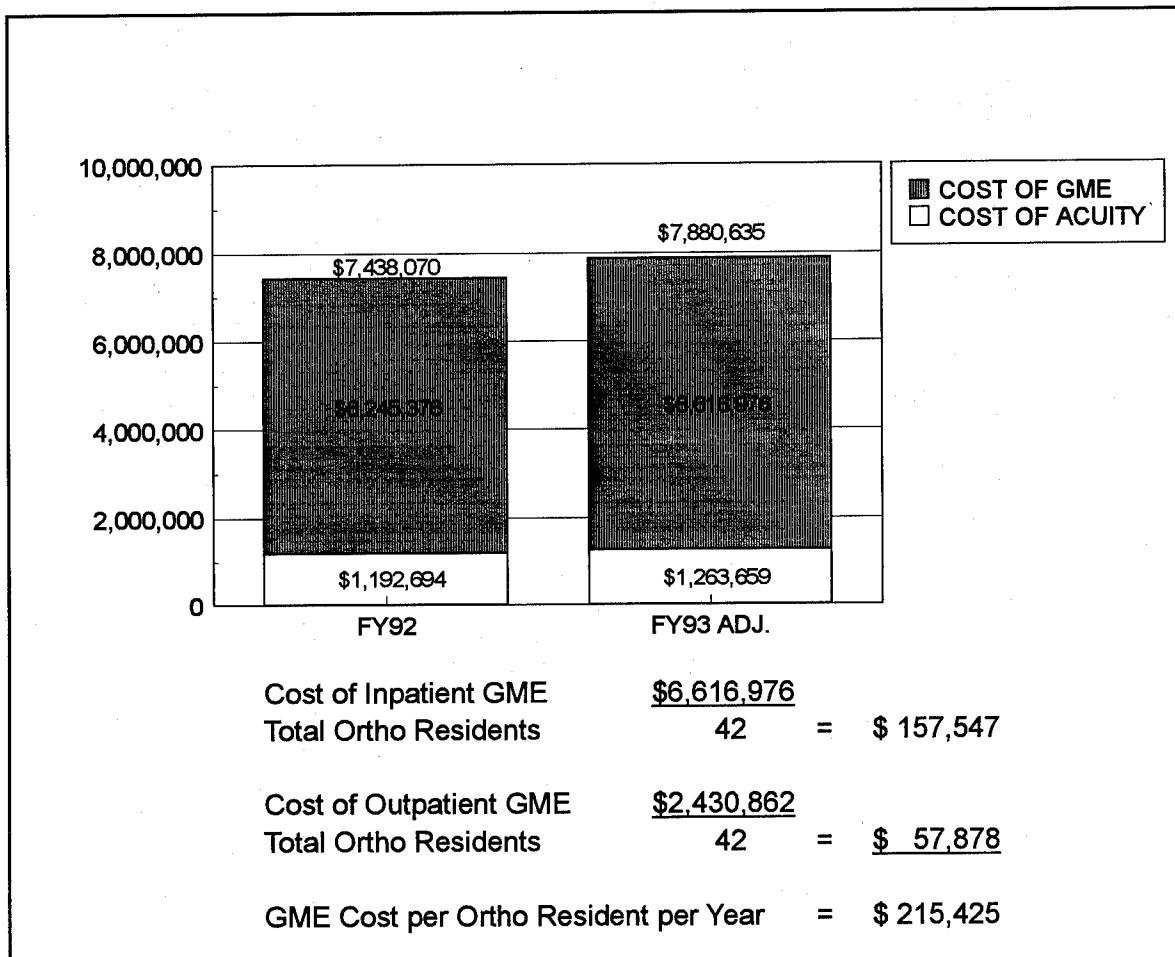
**Table 7.--OBGYN GME Cost With Acuity Adjustment**

|   | INPATIENT EXPENSES  | ADJUSTED IP EXPENSES | OBGYN INTERN/RESIDENTS | DISP         | RCMI   | AMUS   |
|---|---------------------|----------------------|------------------------|--------------|--------|--------|
| BAMC  | \$8,320,403         | \$8,815,467          | 17                     | 2,151        | 1.3270 | 2,854  |
| FAMC  | \$7,752,836         | \$8,214,130          | 10                     | 1,920        | 1.3262 | 2,546  |
| Adjustment for acuity   | (\$669,324)         | (\$740,934)          |                        |              |        |        |
| Total cost for teaching facilities  | \$15,373,915        | \$16,288,663         | 27                     | 4,071        | 1.2987 | 5,401  |
| Teaching facility cost per disposition  |                     | \$4,001              |                        |              |        |        |
| Fort Bragg  | \$5,181,690         | \$5,490,318          | 0                      | 3,183        | 0.8652 | 2,722  |
| Fort Stewart  | \$6,158,032         | \$6,524,495          | 0                      | 2,517        | 0.8973 | 2,258  |
| Total cost for non-teaching facilities  | \$11,340,022        | \$12,014,753         | 0                      | 5,700        | 0.8677 | 4,581  |
| Non-teaching facility cost per disposition                                    |                     | \$2,108              |                        |              |        |        |
| Cost per GME disposition  |                     | \$1,893              |                        |              |        | 0.4310 |
| Difference in teaching and non-teaching average RCMI                          |                     |                      |                        |              |        |        |
| Cost per GME disposition per intern/resident                                  |                     | \$70                 |                        |              |        |        |
| Annual cost of OBGYN GME (Inpatient)  | \$4,033,893         | \$4,273,910          |                        |              |        |        |
| Average annual cost per OBGYN intern/resident (Inpatient)                     | \$149,403           | \$158,253            |                        |              |        |        |
|   | OUTPATIENT EXPENSES | ADJUSTED OP EXPENSES | OBGYN INTERN/RESIDENTS | TOTAL VISITS | AMUS   |        |
| BAMC  | \$2,570,997         | \$2,723,971          | 17                     | 102,260      | 3,540  |        |
| FAMC  | \$2,707,052         | \$2,989,075          | 10                     | 63,582       | 2,212  |        |
| Total cost for teaching facilities  | \$5,278,949         | \$5,593,046          | 27                     | 165,842      | 5,752  |        |
| Teaching facility cost per clinic visit                                       |                     | \$34                 |                        |              |        |        |
| Fort Bragg  | \$2,334,256         | \$2,473,144          | 0                      | 48,177       | 1,624  |        |
| Fort Stewart  | \$2,320,797         | \$2,458,884          | 0                      | 29,356       | 994    |        |
| Total cost for non-teaching facilities  | \$4,655,053         | \$4,932,029          | 0                      | 77,533       | 2,618  |        |
| Non-teaching facility cost per clinic visit                                   |                     | \$64<br>(\$30)       |                        |              |        |        |
| Cost per GME clinic visit   |                     |                      |                        |              |        |        |
| Annual cost of OBGYN GME (Outpatient)   | \$623,896           | \$661,018            |                        |              |        |        |
| Average annual cost per OBGYN intern/resident (Outpatient)                    | \$23,107            | \$24,482             |                        |              |        |        |
| Combined inpatient/outpatient average cost per OBGYN intern/resident per year | \$172,511           | \$182,775            |                        |              |        |        |

Previous results from the orthopedic GME program compiled with those from OBGYN yield estimations of annual expenses for orthopedic residents and OBGYN interns/residents, adjusted for severity of illness, of \$215,425 and \$182,775 respectively.

### Graphical Summary

Figures 14 and 15 graphically summarize the cost of inpatient orthopedic and OBGYN GME in relation to the cost of acuity. Inpatient and outpatient costs are divided by the output and summed to derive the cost per resident or intern/resident, as appropriate.



**Figure 14.** Summary of Orthopedic GME

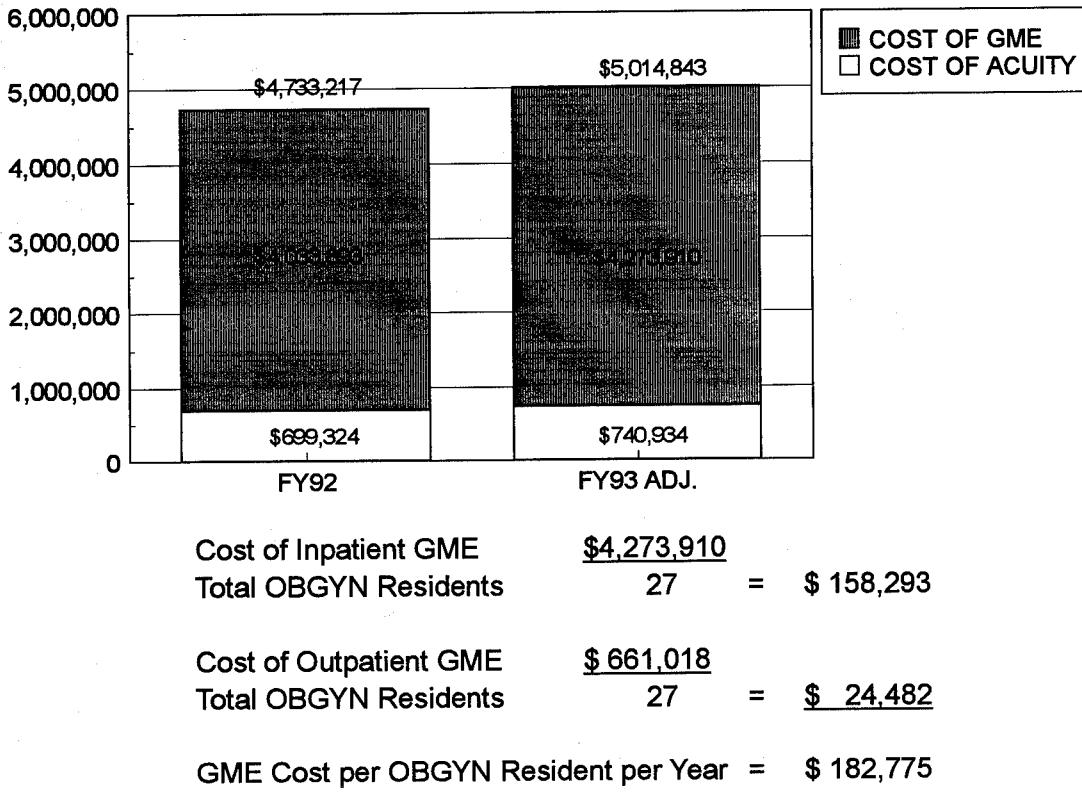


Figure 15. Summary of OBGYN GME

## CHAPTER 4

### DISCUSSION

#### Impact Based on Type of Internship

Orthopedics and OBGYN residency programs are different in many ways, but one major difference is in the type of internship required for each. Orthopedic residency programs have transitional internships as a prerequisite, requiring residents to rotate through a broad range of services during their first year. However, OBGYN has primarily categorical internships where all first year interns already accepted for an OBGYN residency focus on OBGYN during their intern year. This difference in program structure results in OBGYN intern and specialty medical education expenses (GME) being incurred during the first year; while orthopedic GME expenses begin during the second year. Consequently, the cost of GME for OBGYN is a per intern/resident annual cost; compared to the annual cost per resident, for the orthopedic program.

#### Limitations

Since the data used in this study comes primarily from MEPRS and one of the basic assumptions of this model is that MEPRS data is accurate, it is important to have a strong working knowledge of the MEPRS system. Like many cost accounting systems, the expense tracking portion of MEPRS is based on

classical cost accounting methods. This implies that the accuracy of the workload and expenses captured, as well as the method in which overhead charges are allocated to the work centers is dependent upon a number of measurements. Though some measurements are fairly standard with little room for error, others are somewhat subjective.

Limitations associated with this study follow. Note that all limitations are not directly attributable to the MEPRS system.

When developing a method to manually allocate expenses captured in the MEPRS F accounts back to the OBGYN departments, three limitations were noted.

1) The resource allocation methodology developed by the clinical investigation department uses a resource weight to assign varying levels of utilization to each service. The designation of this weight is a subjective decision based on logic, but none-the-less subjective. The expenses allocated to each teaching facility could be inflated or deflated depending on the accuracy of the resource weight. This would cause an increase or decrease in the cost per resident, depending on the direction of the subjective error.

2) The Army composite pay scales, used within MEPRS to allocate military salaries to the appropriate work center, are considered problematic. These pay scales calculate average annual salaries by averaging pay and benefits for all military personnel by grade, with no consideration given to area of

concentration (AOC). Although all officers receive entitlements for quarters and subsistence, few, other than physicians, get specialty pay and bonuses. Those that do receive specialty pay and bonuses, do not receive amounts equal to those received by physicians. When averaging the salaries by grade, instead of by AOC, the composite pay scales inappropriately reduce the average annual salary of a physician. This not only affects those salaries manually allocated from the F accounts, but also the salaries of the teaching and staff physicians, automatically allocated by MEPRS. Therefore, all military salary expenses captured in MEPRS for physicians are deflated to some degree. This means the cost per resident, as determined by this model, is marginally deflated compared to what it would be if salaries were captured by AOC.

3) GME expenses associated with temporary duty (TDY) for OBGYN residents is also captured in the F accounts, along with TDY expenses for all other interns, residents, and fellows. Since MEPRS does not break these expenses out by type of intern, resident, or fellow, there is no reasonable way to manually allocate them. Many residency programs incur GME TDY expenses, therefore it can predicted that the cost per resident is less than what it would be if these TDY expenses could be accurately allocated. Additionally, because the adjustments to manually allocate clinical investigation and salary expenses were applied only to OBGYN in this study, it can be expected that the cost per orthopedic resident would be higher had the adjustment been

applied. According to the clinical investigation model of resource consumption, orthopedics has been identified as having a resource weight two times that of OBGYN. Based on this information it is expected that the cost per orthopedic resident increases \$23,263 for clinical investigation expenses and \$37,791 for salaries. This would increase the current cost per orthopedic resident to \$276,054.

#### Comparisons to Previous Work

Though this study uses data from a system designed around classical cost accounting, the approach of measuring GME costs by comparing differences in expenses between teaching and non-teaching departments, according to the literature, has not been attempted previously. The assumption that this difference is attributed to GME, is a logical argument if it is accepted that everything done in a non-teaching hospital by specialty, would be done the same way in a teaching hospital, if not for GME. It is with this concept that this model is able to overcome the theory that the true cost of a single product (GME) cannot be found in an environment where several products are produced jointly (Koehler and Slighton 1978, 532).

The ability to apply this methodology to another service is primarily dependent on the comparability of workload and the degree of student overlap into other specialty and sub-specialty areas. Statistically, increasing the sample size of comparable workload among teaching and non-teaching facilities will increase the accuracy of the results.

Because the annual cost per resident by specialty was not determined in the Brooke, Hudak, and Finstuen (1993) study, a direct comparison between the two methodologies, based on that measurement, cannot be made. However, comparisons based on cost per GME disposition are possible. The GME cost per orthopedic disposition in the Brooke, Hudak, and Finstuen model was \$1,683, compared to \$1,993 in this model; a difference of \$310. Results in the Brooke, Hudak, and Finstuen model were based on 1988-1990 data. An adjustment for three years of inflation would increase their figure to \$2,069, resulting in a difference of \$76. The GME cost per OBGYN disposition in the Brooke, Hudak, and Finstuen model, adjusted for inflation, was \$611; compared to \$2,075 for this model, a difference of \$1,464. This greater difference can be attributed partially to the additional allocation of clinical investigation expenses and residents' salaries that were not included in the orthopedics service. Another factor contributing to this difference is that Brooke, Hudak, and Finstuen considered all teaching and non-teaching programs in predicting the cost of an OBGYN GME disposition. However, in this model, workload from only two teaching and two non-teaching OBGYN programs were comparable. This study also supports Brooke, Hudak, and Finstuen's finding that costs of GME vary among specialties, so efforts to determine those costs should be focused by specialty rather than by facility.

This model indicates that orthopedic and OBGYN costs per disposition are, respectively, 83 percent and 89 percent higher

in teaching hospitals. This more favorable finding supports that of the Commonwealth Fund's Task Force (1985) where teaching hospitals in 1981 had 126 percent higher operating costs per disposition compared to non-teaching hospitals.

The results of this study compare closely to those of Valberg and Gonyea (1993) where the average annual cost of specialty GME among 126 medical schools nation wide was \$194,383 per resident. The Gonyea methodology did not identify the cost of GME by specialty; however it can reasonably be concluded that the difference between the average cost per resident per year, and the average cost per orthopedic and OBGYN resident per year in this study, is small enough to safely infer the validity and reliability of the methodology.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

The development of this methodology has enabled the AMEDD to determine the cost for orthopedics and OBGYN residency programs with minimal expenditure of resources. This non-traditional approach to costing GME provides HSC with a mechanism for determining GME costs for all residency programs where teaching and non-teaching facilities have comparable workload. Additionally, results obtained through the application of this methodology may be used as a benchmark for future internal and external comparisons.

#### Future Research

The next logical step would be to determine the value of each residency program using the results of this study as a foundation. Further research can build upon these results in order to examine whether or not the cost of GME, as determined by this methodology, is an acceptable expense. These costs can be compared to the costs of GME in other public and private programs, as well as what civilian teaching institutions might charge to train military physicians. Additional research to identify the costs associated with the loss of health care provided to beneficiaries in military hospitals would have to be

determined. From this information, the senior leadership within the AMEDD would be able to make informed decisions regarding the reorganization and restructuring of GME, as necessary.

Applying this methodology to residency programs such as general surgery and internal medicine may yield inflated results. Based on preliminary analysis, it may be necessary to develop a modification to this methodology compensating for the overlap of additional residents and fellows in other disciplines incurring GME expenses in the services being studied. For instance, a methodology that could separate the amount of time a general surgery resident spends in each department as a proportion, in relation to the time other residents and fellows spend in the same department, would be most beneficial. This would allow a researcher to apply that ratio against the total MEPERS expenses captured in that department. The result would be expenses incurred for only general surgery residents, allowing for analysis based on this methodology.

MEPRS was not designed to cost out patient procedures or provide expenses by product line, such as GME; however it is the only expense and workload tracking system in DoD. Additionally, Congress and leaders at DoD use this data to make decisions regarding the military health care system.

The inference of the results yielded by this methodology can only be generalized for federal sector hospital systems using MEPRS to capture workload and expenses. Recognizing that MEPRS was designed specifically for DoD facilities, this methodology

should be replicated on hospital systems in the public and private sector that use other types of accounting systems.

**Appendix 1. 1992 Inpatient Orthopedic Expenses and Workload**

|            | DIRECT EXPENSES | SUPPORT EXPENSES | ANCILLARY EXPENSES | PURIFIED EXPENSES | NET EXPENSES  | DISP     | RWPS     | BEDDAYS   | RCM    | IWUS   |
|------------|-----------------|------------------|--------------------|-------------------|---------------|----------|----------|-----------|--------|--------|
| WRAMC      | \$1,726,058     | \$2,311,190      | \$3,143,311        | \$4,854,397       | \$12,034,956  | 1,459    | 2272.9   | 22,292    | 1,9231 | 2,806  |
| TAMC       | \$950,612       | \$843,736        | \$4,092,160        | \$3,197,119       | \$9,083,627   | 1,806    | 2161.3   | 11,421    | 1,4765 | 2,667  |
| FAMC       | \$497,894       | \$1,294,979      | \$4,274,044        | \$2,022,821       | \$8,089,538   | 1,873    | 2219.7   | 14,481    | 1,4599 | 2,734  |
| BAMC       | \$469,821       | \$1,037,281      | \$3,447,150        | \$2,213,954       | \$7,168,206   | 1,684    | 2017.9   | 13,426    | 1,4777 | 2,488  |
| MAMC       | \$375,153       | \$428,021        | \$3,957,754        | \$1,461,616       | \$6,222,544   | 1,381    | 1382.2   | 6,641     | 1,2341 | 1,704  |
| EAMC       | \$181,176       | \$705,418        | \$3,150,107        | \$2,078,809       | \$6,115,510   | 1,423    | 1779.2   | 12,095    | 1,5365 | 2,186  |
| WBAMC      | \$579,984       | \$581,010        | \$2,333,936        | \$1,848,168       | \$5,343,098   | 1,169    | 1325.7   | 6,984     | 1,3985 | 1,635  |
| BRAGG      | \$184,424       | \$354,762        | \$1,922,412        | \$1,242,521       | \$3,704,119   | 1,860    | 1671.7   | 7,491     | 1,1072 | 2,059  |
| PRESIDIO   | \$138,050       | \$806,684        | \$1,295,161        | \$1,369,236       | \$3,609,131   | 323      | 533.6    | 4,288     | 2,0373 | 658    |
| CARSON     | \$139,806       | \$569,502        | \$1,693,917        | \$999,569         | \$3,392,594   | 1,348    | 1235.3   | 4,463     | 1,1301 | 1,523  |
| BENNING    | \$117,456       | \$502,180        | \$1,576,578        | \$1,067,028       | \$3,263,242   | 860      | 1004.0   | 8,048     | 1,4397 | 1,238  |
| CAMPBELL   | \$158,896       | \$366,244        | \$1,865,081        | \$766,148         | \$3,146,369   | 1,307    | 1173.3   | 5,206     | 1,1062 | 1,446  |
| HOOD       | \$99,921        | \$268,186        | \$1,821,926        | \$808,263         | \$2,998,296   | 1,069    | 965.4    | 3,528     | 1,1137 | 1,191  |
| W POINT    | \$129,092       | \$366,084        | \$1,385,638        | \$617,905         | \$2,498,719   | 849      | 720.1    | 2,776     | 1,0459 | 888    |
| KNOX       | \$78,966        | \$351,142        | \$1,150,440        | \$824,664         | \$2,405,212   | 866      | 742.4    | 2,762     | 1,0566 | 915    |
| JACKSON    | \$61,051        | \$530,463        | \$1,052,159        | \$756,140         | \$2,399,813   | 891      | 913.9    | 6,952     | 1,2649 | 1,127  |
| MEADE      | \$57,743        | \$371,030        | \$1,074,038        | \$702,527         | \$2,205,338   | 593      | 540.6    | 2,299     | 1,1204 | 664    |
| SILL       | \$76,506        | \$220,828        | \$1,143,520        | \$493,318         | \$1,934,172   | 764      | 672.8    | 2,482     | 1,0859 | 830    |
| EUSTIS     | \$259,153       | \$257,444        | \$848,058          | \$519,675         | \$1,884,330   | 660      | 571.8    | 2,404     | 1,0835 | 705    |
| ORD        | \$11,714        | \$255,412        | \$1,121,678        | \$420,740         | \$1,809,544   | 495      | 565.9    | 3,007     | 1,4098 | 698    |
| PANAMA     | \$119,089       | \$321,174        | \$805,345          | \$534,626         | \$1,780,234   | 726      | 575.3    | 2,839     | 0,9773 | 710    |
| L WOOD     | \$72,568        | \$261,303        | \$884,528          | \$497,991         | \$1,716,390   | 469      | 454.0    | 2,858     | 1,1939 | 560    |
| RILEY      | \$58,575        | \$220,048        | \$896,679          | \$367,779         | \$1,543,081   | 741      | 629.1    | 1,927     | 1,047  | 776    |
| STEWART    | \$18,041        | \$162,557        | \$926,534          | \$435,728         | \$1,542,860   | 552      | 579.3    | 1,852     | 1,2942 | 714    |
| POLK       | \$46,752        | \$182,585        | \$775,767          | \$386,860         | \$1,391,964   | 512      | 416.0    | 1,712     | 1,0021 | 513    |
| LEAVENWORT | \$6,225         | \$202,237        | \$898,683          | \$277,604         | \$1,384,749   | 467      | 401.1    | 821       | 1,0593 | 495    |
| ALASKA     | \$24,755        | \$145,131        | \$610,764          | \$321,477         | \$1,102,127   | 300      | 270.1    | 957       | 1,1102 | 333    |
| RUCKER     | \$24,007        | \$59,039         | \$673,277          | \$205,235         | \$1,061,558   | 603      | 541.8    | 1,223     | 1,1037 | 666    |
| LEE        | \$35,803        | \$230,809        | \$397,402          | \$339,680         | \$1,003,694   | 346      | 304.1    | 1,945     | 1,0839 | 375    |
| HAUCHUCA   | \$29,413        | \$128,994        | \$553,451          | \$278,778         | \$990,636     | 501      | 414.2    | 1,014     | 1,0195 | 511    |
| MCCLELLAN  | \$62,799        | \$123,973        | \$545,048          | \$235,148         | \$966,968     | 368      | 315.9    | 1,021     | 1,0585 | 390    |
| BELVOIR    | \$11,114        | \$71,905         | \$662,009          | \$188,305         | \$933,333     | 430      | 377.3    | 1,034     | 1,0822 | 465    |
| IRWIN      | \$47,001        | \$133,289        | \$382,850          | \$293,702         | \$856,842     | 273      | 232.6    | 1,150     | 1,0391 | 284    |
| DEVENS     | \$38,788        | \$121,823        | \$484,394          | \$177,669         | \$822,674     | 265      | 244.1    | 681       | 1,1337 | 300    |
| MONMOUTH   | \$0             | \$168,692        | \$230,462          | \$224,160         | \$623,314     | 179      | 150.0    | 827       | 1,0274 | 184    |
| B HARRISON | \$278           | \$41,870         | \$153,043          | \$68,378          | \$263,569     | 92       | 69.0     | 99        | 0,9251 | 85     |
| REDSTONE   | \$0             | \$11,308         | \$178,050          | \$16,916          | \$206,274     | 77       | 48.6     | 77        | 0,7791 | 60     |
|            | \$6,888,284     | \$15,088,333     | \$52,407,354       | \$33,114,654      | \$107,498,625 | \$29,581 | \$30,492 | \$165,063 | 1,2008 | 37,583 |

**Appendix 2. 1992 Outpatient Orthopedic Expenses and Workload**

|              | DIRECT EXPENSES     | EXPENSE FROM E      | EXPENSE FROM D      | NET PURIFIED       | TOTAL EXPENSES      | OUTPAT VISITS  | INPAT VISITS  | TOTAL VISITS   | TOTAL AWU     |
|--------------|---------------------|---------------------|---------------------|--------------------|---------------------|----------------|---------------|----------------|---------------|
| TAMC         | \$1,450,244         | \$779,006           | \$1,710,955         | \$8,163            | \$3,948,368         | 55,044         | 695           | 55,739         | 1,704         |
| MAMC         | \$1,889,845         | \$672,475           | \$1,246,347         | \$0                | \$3,808,667         | 30,005         | 723           | 30,728         | 967           |
| BAMC         | \$1,384,741         | \$563,066           | \$1,368,016         | \$0                | \$3,315,823         | 25,870         | 3,934         | 29,804         | 943           |
| EAMC         | \$1,427,862         | \$528,675           | \$1,147,601         | \$194,013          | \$3,288,151         | 32,105         | 543           | 32,648         | 932           |
| FAMC         | \$1,021,340         | \$1,033,538         | \$1,066,185         | \$161,204          | \$3,282,267         | 39,440         | 2,165         | 41,605         | 1,379         |
| CARSON       | \$1,400,660         | \$618,743           | \$1,113,750         | \$705              | \$3,133,858         | 28,883         | 1,400         | 30,283         | 997           |
| WBAMC        | \$1,283,693         | \$682,233           | \$992,876           | \$0                | \$2,958,802         | 28,812         | 742           | 29,554         | 947           |
| BRAGG        | \$1,453,968         | \$367,777           | \$1,025,943         | \$0                | \$2,847,688         | 48,324         | 775           | 49,099         | 1,400         |
| WRAMC        | \$1,169,782         | \$798,507           | \$272,019           | \$288,538          | \$2,528,846         | 16,013         | 2,327         | 18,340         | 502           |
| KNOX         | \$1,279,484         | \$332,380           | \$846,929           | \$57,648           | \$2,518,441         | 34,224         | 373           | 34,597         | 900           |
| HOOD         | \$1,073,689         | \$353,263           | \$923,261           | \$0                | \$2,350,213         | 40,913         | 1,106         | 42,019         | 1,158         |
| JACKSON      | \$806,233           | \$145,485           | \$518,932           | \$845,273          | \$2,115,923         | 22,396         | 1,113         | 24,109         | 658           |
| BENNING      | \$924,673           | \$335,889           | \$732,733           | \$27,514           | \$2,020,609         | 28,469         | 2,380         | 30,849         | 953           |
| L WOOD       | \$907,822           | \$267,769           | \$653,056           | \$6,081            | \$1,814,728         | 20,904         | 241           | 21,145         | 574           |
| CAMPBELL     | \$807,883           | \$450,468           | \$531,377           | \$0                | \$1,789,726         | 30,630         | 1,562         | 32,192         | 1,044         |
| STEWART      | \$442,123           | \$231,677           | \$585,756           | \$429,406          | \$1,688,962         | 23,120         | 191           | 23,311         | 615           |
| SILL         | \$666,749           | \$273,601           | \$725,458           | \$0                | \$1,665,808         | 18,959         | 1,018         | 19,977         | 653           |
| PRESIDIO     | \$264,082           | \$306,867           | \$519,979           | \$318,583          | \$1,409,311         | 8,499          | 834           | 9,333          | 263           |
| WPOINT       | \$588,409           | \$254,982           | \$531,658           | \$12,063           | \$1,387,012         | 17,284         | 216           | 17,500         | 595           |
| PANAMA       | \$501,108           | \$289,223           | \$429,179           | \$77,641           | \$1,307,151         | 19,115         | 539           | 19,654         | 633           |
| ORD          | \$675,841           | \$244,583           | \$343,058           | \$0                | \$1,263,482         | 18,842         | 1,374         | 20,216         | 652           |
| BELVIOR      | \$531,561           | \$210,088           | \$197,341           | \$229,650          | \$1,168,640         | 17,164         | 368           | 17,532         | 550           |
| ALASKA       | \$162,374           | \$268,759           | \$320,227           | \$415,786          | \$1,167,146         | 13,333         | 341           | 13,674         | 422           |
| RILEY        | \$344,430           | \$132,539           | \$356,019           | \$205,255          | \$1,038,243         | 14,844         | 71            | 14,915         | 473           |
| RUCKER       | \$372,423           | \$117,362           | \$339,119           | \$168,125          | \$997,029           | 13,144         | 148           | 13,292         | 432           |
| EUSTIS       | \$114,726           | \$143,864           | \$392,952           | \$326,482          | \$978,024           | 19,222         | 1,200         | 20,422         | 666           |
| MEADE        | \$248,281           | \$96,136            | \$324,886           | \$271,066          | \$940,369           | 9,654          | 639           | 10,293         | 343           |
| POLK         | \$422,963           | \$162,972           | \$324,769           | \$0                | \$910,704           | 11,833         | 529           | 12,362         | 383           |
| LEE          | \$123,860           | \$93,712            | \$443,108           | \$207,382          | \$888,062           | 17,014         | 205           | 17,219         | 414           |
| HUACHUCA     | \$123,501           | \$77,576            | \$241,848           | \$194,362          | \$637,287           | 12,970         | 0             | 12,970         | 377           |
| DRUM         | \$76,371            | \$74,996            | \$204,650           | \$238,973          | \$594,980           | 4,267          | 0             | 4,267          | 151           |
| LEAVEN       | \$65,453            | \$83,595            | \$193,722           | \$216,827          | \$559,597           | 10,355         | 0             | 10,355         | 334           |
| MCCLELLAN    | \$122,671           | \$50,010            | \$190,491           | \$194,179          | \$557,351           | 7,803          | 103           | 7,906          | 263           |
| MONMOUTH     | \$69,881            | \$54,109            | \$178,700           | \$165,187          | \$467,877           | 4,268          | 0             | 4,268          | 135           |
| DEVENS       | \$209,944           | \$113,244           | \$139,000           | \$0                | \$462,188           | 7,570          | 0             | 7,570          | 234           |
| IRWIN        | \$64,597            | \$24,276            | \$191,440           | \$177,480          | \$457,793           | 3,138          | 7             | 3,145          | 100           |
| B HARR       | \$15,345            | \$17,428            | \$19,568            | \$1,048            | \$53,389            | 2,411          | 0             | 2,411          | 80            |
| REDSTONE     | \$0                 | \$16,245            | \$1,542             | \$11,634           | \$29,421            | 822            | 0             | 822            | 30            |
| <b>TOTAL</b> | <b>\$24,288,612</b> | <b>\$11,276,556</b> | <b>\$21,326,450</b> | <b>\$5,450,268</b> | <b>\$62,341,886</b> | <b>758,263</b> | <b>27,862</b> | <b>786,125</b> | <b>23,856</b> |

**Appendix 3. 1992 Inpatient OBGYN Expenses and Workload**

|              | DIRECT EXPENSES     | SUPPORT EXPENSES    | ANCILLARY EXPENSES  | PURIFIED EXPENSES   | Ci EXPENSES        | 50% RESIDENT SALARIES | NET EXPENSES         | RWPS          | BEDDAYS       | RCMI           | WUS           |
|--------------|---------------------|---------------------|---------------------|---------------------|--------------------|-----------------------|----------------------|---------------|---------------|----------------|---------------|
| TAMC         | \$2,579,915         | \$5,860,285         | \$8,440,200         | \$157,096           | \$259,074          | \$23,978,016          | 6,395                | 3,564         | 23,873        | 0.5573         | 4,395         |
| MAMC         | \$2,064,876         | \$5,847,879         | \$7,912,755         | \$2,632,617         | \$89,879           | \$604,656             | \$19,152,862         | 2,740         | 1,967         | 16,888         | 0.5839        |
| WRAMC        | \$346,908           | \$2,691,127         | \$3,038,035         | \$6,445,010         | \$396,558          | \$453,492             | \$13,371,130         | 2,588         | 1,967         | 16,888         | 0.7600        |
| BAMC         | \$395,729           | \$2,577,185         | \$2,972,914         | \$3,899,057         | \$94,834           | \$453,492             | \$10,393,211         | 2,151         | 1,508         | 9,570          | 0.7014        |
| WBAMC        | \$414,674           | \$1,975,028         | \$1,975,028         | \$4,643,724         | \$188,325          | \$453,492             | \$10,064,945         | 3,629         | 1,899         | 11,928         | 0.5234        |
| FAMC         | \$488,445           | \$2,630,702         | \$2,118,147         | \$2,389,702         | \$238,462          | \$377,910             | \$7,735,413          | 1,920         | 1,205         | 9,886          | 0.6273        |
| HOOD         | \$261,974           | \$2,373,300         | \$2,635,274         | \$4,143,088         | \$0                | \$0                   | \$4,413,636          | 5,315         | 2,615         | 11,575         | 0.4920        |
| STEWART      | \$289,278           | \$1,681,538         | \$1,950,816         | \$3,258,075         | \$0                | \$0                   | \$1,259,707          | 2,517         | 1,308         | 7,953          | 0.5195        |
| BRAGG        | \$394,454           | \$1,505,831         | \$1,900,285         | \$2,796,782         | \$0                | \$0                   | \$6,597,352          | 3,183         | 1,562         | 8,381          | 0.4907        |
| BENNING      | \$224,139           | \$1,755,048         | \$1,979,187         | \$2,524,853         | \$0                | \$0                   | \$6,583,227          | 2,953         | 1,444         | 7,308          | 0.5080        |
| CAMPBELL     | \$250,385           | \$1,338,186         | \$1,588,551         | \$2,616,840         | \$0                | \$0                   | \$6,793,942          | 2,512         | 1,096         | 5,713          | 0.4740        |
| KNOX         | \$223,489           | \$1,283,777         | \$1,717,266         | \$2,231,074         | \$0                | \$0                   | \$5,965,806          | 1,572         | 798           | 4,158          | 0.5082        |
| CARSON       | \$195,581           | \$1,176,066         | \$1,371,647         | \$2,724,525         | \$0                | \$0                   | \$5,467,819          | 2,233         | 1,082         | 6,182          | 0.4847        |
| RILEY        | \$285,014           | \$1,059,344         | \$1,344,358         | \$1,921,927         | \$0                | \$0                   | \$4,610,643          | 1,937         | 920           | 4,330          | 0.4748        |
| BELVOIR      | \$153,425           | \$1,130,161         | \$1,283,586         | \$1,849,275         | \$0                | \$0                   | \$4,416,447          | 1,402         | 663           | 4,058          | 0.4730        |
| EAMC         | \$214,151           | \$1,031,019         | \$1,245,170         | \$1,985,888         | \$0                | \$0                   | \$3,386,238          | 2,166         | 1,307         | 5,379          | 0.6034        |
| ORD          | \$33,859            | \$1,186,739         | \$1,134,598         | \$1,715,428         | \$0                | \$0                   | \$3,984,624          | 1,992         | 735           | 4,370          | 0.4928        |
| PANAMA       | \$244,214           | \$973,938           | \$1,218,152         | \$1,529,185         | \$0                | \$0                   | \$3,965,489          | 1,966         | 772           | 5,185          | 0.4932        |
| RUCKER       | \$27,784            | \$1,127,705         | \$1,155,469         | \$1,218,719         | \$0                | \$0                   | \$3,439,857          | 1,319         | 838           | 3,244          | 1,335         |
| POLK         | \$107,709           | \$591,338           | \$899,047           | \$1,258,267         | \$0                | \$0                   | \$3,256,361          | 1,026         | 527           | 2,986          | 0.5136        |
| LWOOD        | \$87,035            | \$800,746           | \$887,781           | \$1,032,786         | \$0                | \$0                   | \$2,908,348          | 919           | 482           | 2,476          | 0.5239        |
| HUACHUCA     | \$73,071            | \$710,862           | \$1,174,540         | \$1,783,933         | \$0                | \$0                   | \$1,742,406          | 1,271         | 592           | 3,198          | 0.4680        |
| ALASKA       | \$149,933           | \$728,441           | \$878,374           | \$1,134,598         | \$0                | \$0                   | \$2,701,629          | 983           | 467           | 2,734          | 0.4754        |
| SILL         | \$136,101           | \$738,489           | \$976,590           | \$957,187           | \$0                | \$0                   | \$2,610,367          | 835           | 516           | 2,668          | 0.6178        |
| MCCLELLAN    | \$128,523           | \$709,566           | \$839,089           | \$740,111           | \$0                | \$0                   | \$2,418,289          | 791           | 457           | 2,604          | 0.5780        |
| WPOINT       | \$187,696           | \$474,513           | \$862,209           | \$883,426           | \$0                | \$0                   | \$1,707,844          | 388           | 217           | 1,124          | 0.5582        |
| IRWIN        | \$62,420            | \$503,148           | \$835,224           | \$824,603           | \$0                | \$0                   | \$1,641,520          | 597           | 307           | 1,811          | 0.5137        |
| JACKSON      | \$383,324           | \$485,706           | \$111,296           | \$150,101           | \$0                | \$0                   | \$1,222,889          | 295           | 273           | 1,400          | 0.6915        |
| MEADE        | \$10,485            | \$867,1328          | \$977,444           | \$1,172,444         | \$0                | \$0                   | \$1,004,558          | 674           | 434           | 883            | 0.6438        |
| EUSTIS       | \$71,152            | \$397,431           | \$553,191           | \$520,029           | \$0                | \$0                   | \$901,803            | 344           | 1,255         | 1,255          | 0.8595        |
| REDSTONE     | \$59,889            | \$413,630           | \$109,237           | \$554,466           | \$0                | \$0                   | \$737,222            | 196           | 142           | 734            | 0.7283        |
| LEE          | \$24,490            | \$332,621           | \$74,116            | \$94,030            | \$0                | \$0                   | \$525,257            | 396           | 248           | 676            | 0.6250        |
| DEVENS       | \$0                 | \$218,576           | \$20,842            | \$218,576           | \$0                | \$0                   | \$467,984            | 93            | 111           | 117            | 1,1975        |
| LEAVEN       | \$0                 | \$32,655            | \$132,655           | \$23,137            | \$0                | \$0                   | \$288,447            | 81            | 50            | 79             | 0.6210        |
| BHARR        | \$200               | \$68,154            | \$27,585            | \$44,914            | \$0                | \$0                   | \$140,833            | 48            | 34            | 64             | 0.7000        |
| MONMOUTH     | \$0                 | \$35,443            | \$17,388            | \$20,831            | \$0                | \$0                   | \$73,862             | 82            | 47            | 114            | 0.5720        |
| <b>TOTAL</b> | <b>\$10,803,282</b> | <b>\$47,328,285</b> | <b>\$55,821,378</b> | <b>\$85,537,988</b> | <b>\$1,165,154</b> | <b>\$2,872,116</b>    | <b>\$183,529,203</b> | <b>60,283</b> | <b>33,220</b> | <b>190,718</b> | <b>0.5915</b> |

**Appendix 4. 1992 Outpatient OBGYN Expenses and Workload**

|              | DIRECT EXPENSES    | SUPPORT EXPENSES    | ANCILLARY EXPENSES | PURIFIED EXPENSES   | NET EXPENSES        | TOTAL VISITS  | TOTAL AWU |
|--------------|--------------------|---------------------|--------------------|---------------------|---------------------|---------------|-----------|
| MAMC         | \$518,665          | \$2,201,459         | \$1,098,885        | \$2,227,830         | \$6,046,839         | 104,438       | 2,607     |
| TAMC         | \$779,915          | \$3,403,346         | \$598,087          | \$1,161,248         | \$5,942,596         | 95,199        | 2,414     |
| WRAMC        | \$447,014          | \$1,569,138         | \$414,204          | \$1,613,289         | \$4,043,645         | 30,870        | 750       |
| WBAMC        | \$855,510          | \$1,916,441         | \$707,017          | \$444,214           | \$3,923,182         | 65,406        | 1,615     |
| HOOD         | \$453,580          | \$1,748,603         | \$390,767          | \$1,178,939         | \$3,771,889         | 67,619        | 1,707     |
| CAMPBELL     | \$676,260          | \$978,268           | \$351,978          | \$1,508,100         | \$3,514,606         | 52,665        | 1,319     |
| EAMC         | \$332,413          | \$1,627,893         | \$245,023          | \$894,667           | \$3,099,996         | 26,551        | 644       |
| CARSON       | \$277,955          | \$1,063,712         | \$220,187          | \$1,362,390         | \$2,974,244         | 40,976        | 1,024     |
| FAMC         | \$294,441          | \$1,274,672         | \$534,923          | \$603,916           | \$2,707,952         | 23,408        | 589       |
| BAMC         | \$378,840          | \$1,120,671         | \$432,665          | \$638,821           | \$2,570,997         | 42,343        | 1,036     |
| RILEY        | \$187,434          | \$1,214,788         | \$181,155          | \$961,781           | \$2,545,158         | 34,381        | 867       |
| KNOX         | \$616,884          | \$927,960           | \$223,152          | \$670,612           | \$2,438,608         | 37,354        | 928       |
| BRAGG        | \$304,654          | \$1,084,375         | \$141,784          | \$803,443           | \$2,334,256         | 49,794        | 1,266     |
| STEWART      | \$336,730          | \$739,298           | \$194,298          | \$1,050,471         | \$2,320,797         | 30,455        | 775       |
| BELVOIR      | \$253,836          | \$872,023           | \$138,906          | \$686,376           | \$1,951,141         | 29,476        | 739       |
| BENNING      | \$338,948          | \$849,731           | \$165,129          | \$575,119           | \$1,928,927         | 24,673        | 620       |
| RUCKER       | \$156,338          | \$1,027,055         | \$90,377           | \$493,403           | \$1,767,173         | 20,291        | 499       |
| MEADE        | \$237,561          | \$503,586           | \$228,243          | \$721,978           | \$1,691,368         | 32,123        | 764       |
| PANAMA       | \$353,106          | \$821,471           | \$165,832          | \$333,666           | \$1,674,075         | 24,404        | 605       |
| ALASKA       | \$143,112          | \$768,495           | \$116,661          | \$472,103           | \$1,500,371         | 13,939        | 356       |
| SILL         | \$249,059          | \$335,060           | \$80,890           | \$581,373           | \$1,246,382         | 11,066        | 282       |
| JACKSON      | \$110,585          | \$326,847           | \$185,117          | \$521,941           | \$1,144,490         | 17,493        | 413       |
| HUACHUCA     | \$83,290           | \$622,621           | \$115,757          | \$321,520           | \$1,143,188         | 12,750        | 314       |
| POLK         | \$441,977          | \$470,358           | \$156,048          | \$56,638            | \$1,125,021         | 17,080        | 433       |
| MCCLELLAN    | \$57,303           | \$441,033           | \$98,836           | \$299,222           | \$896,394           | 13,279        | 324       |
| EUSTIS       | \$104,936          | \$431,419           | \$120,028          | \$174,567           | \$830,950           | 15,062        | 355       |
| LEE          | \$74,601           | \$387,773           | \$52,352           | \$302,014           | \$816,740           | 9,878         | 233       |
| LWOOD        | \$78,567           | \$252,257           | \$44,164           | \$324,377           | \$699,365           | 9,615         | 227       |
| WPOINT       | \$120,692          | \$257,792           | \$35,220           | \$250,010           | \$663,714           | 5,465         | 135       |
| LEAVEN       | \$4,695            | \$76,187            | \$40,692           | \$456,905           | \$578,479           | 5,507         | 130       |
| MONMOUTH     | \$281,677          | \$181,322           | \$54,992           | \$0                 | \$517,991           | 4,450         | 105       |
| DEVENS       | \$19,088           | \$126,998           | \$153,836          | \$107,994           | \$407,916           | 3,963         | 94        |
| IRWIN        | \$91,541           | \$192,511           | \$48,755           | \$54,943            | \$387,750           | 6,296         | 159       |
| REDSTONE     | \$158,243          | \$88,817            | \$23,736           | \$73,807            | \$344,603           | 5,215         | 123       |
| BHARR        | \$6,661            | \$51,519            | \$14,985           | \$608               | \$73,773            | 1,784         | 42        |
| <b>TOTAL</b> | <b>\$9,826,111</b> | <b>\$29,955,499</b> | <b>\$7,914,681</b> | <b>\$21,928,285</b> | <b>\$69,624,576</b> | <b>24,493</b> |           |

## REFERENCES

- Anderson, Gerard. F., and Judith R. Lave. 1986. Financing graduate medical education using multiple regression to set payment rates. Inquiry 23 (Summer): 191-99.
- Brandel, Doug. 1994. Telephonic interviewed by Gary G. McNeill, 4 February.
- Bircher, John. J., and Burton Ziskind. 1986. The Cost of Graduate Medical Education. The Health Studies Task Force, Office of the Assistant Secretary of Defense.
- Brecher, Charles, and Susan Nesbitt. 1985. Factors associated with variation in financial condition among voluntary hospitals. Health Service Research 20:3 (August): 267-300.
- Brooke, Paul. P., Ronald P. Hudak, and Kenn Finstuen. 1994. Product-Line evaluation of graduate medical education program costs. Hospital and Health Services Administration 39:2 (Summer): 265-78.
- Carr, W. John, and Paul J. Feldstein. 1967. The relationship of cost to hospital size. Inquiry 4(2): 43-65.
- Carroll, Augustus J. 1969. Program cost estimating in a teaching hospital: A pilot study. Evanston, IL: Association of American Medical Colleges, quoted in Bircher, John. J., and Burton Ziskind. 1986. The Cost of Graduate Medical Education. The Health Studies Task Force, Office of the Assistant Secretary of Defense.
- \_\_\_\_\_. 1967. Medical college costs. The Journal of Medical Education 42 (January): 1-15.
- \_\_\_\_\_. 1965. Medical education costs in hospitals. The Journal of Medical Education 40: 137-45.
- \_\_\_\_\_. 1962. Education in Hospitals. The Journal of Medical Education 37 (August): 744-48.

. 1958. A Study of Medical College Costs. Evanston, IL: Association of American Medical Colleges, quoted in Gavett, J. William, and Alvin I. Mushlin. 1986. Calculating the costs of training in primary care. Medical Care 24 (April): 301-12.

Cassimatis, Emmanuel. 1993. GME Briefing for the Army Deputy Chief of Staff for Personnel. Washington, D.C., October.

Custer, William S., and Richard J. Wilke. 1991. Teaching hospital costs: The effects of medical staff characteristics. Health Services Research 25 (February): 831-57.

Engleman, R. C., and R.T. Joy. 1975. Two hundred years of military medicine. The Historical Unit. US Army Medical Department, Fort Detrick, MD, quoted in Ledford, Frank F., and Thomas M. Driskill. 1976. The Army Graduate Medical Education Program. Military Medicine (December): 837-43.

Ernst and Ernst. 1972. Hartford Hospital Study of the Cost of Education Programs, quoted in Ledford, Frank F., and Thomas M. Driskill, Jr. 1976. The Army Graduate Medical Education Program. Military Medicine (December): 837-43.

Ernst and Young. 1994. Health care reform: The Clinton Plan (Assessing the legislative proposal).

Freymann, John G., and John K. Springer. 1973. Cost of hospital based education. Journal of the American Medical Association 224 (March): 65-71.

Gavett, J. William, and Alvin I. Mushlin. 1986. Calculating the costs of training in primary care. Medical Care 24 (April): 301-12.

Gould, K., Kearns, P., Stephen, F., and Maple, M. 1973. Formal Training Course Cost Report for FY 73. Wilford Hall USAF Medical Center, Lackland, AFB, TX, quoted in Ledford, Frank F., and Thomas M. Driskill. 1976. The Army Graduate Medical Education Program. Military Medicine (December): 837-43.

Institute of Medicine. 1981. Report of a study: Graduate Medical Education and Military Medicine. Photocopied.

Koehler, John E., and Robert L. Slichton. 1973. Activity analysis and cost analysis in medical schools. Journal of Medical Education 48 (June): 531-50.

Ledford, Frank F., and Thomas M. Driskill, Jr. 1976. The Army Graduate Medical Education Program. Military Medicine (December): 837-43.

Panton, D. M., A. I. Mushlin, and J. W. Gavett. 1980. Marginal ambulatory teaching cost under varying levels of service utilization. Medical Care 18 (June): 668-74.

Shwartz, Michael, Jeffrey C. Merrill, and Lily Klebanoff Blake. 1984. DRG-based case mix and public hospitals. Medical Care 22 (April): 283-99.

Society of Medical Consultants to the Armed Forces. 1987. Military graduate education under stress. A white paper. Potomic, M.D. Photocopied.

Stern, Robert S., Marion Jennings, Thomas L. Delbanco, Joseph L. Dorsey, John D. Stoeckle, and Robert S. Lawrence S. 1977. Graduate education in primary care: An economic analysis. The New England Journal of Medicine (September): 638-43.

The Commonwealth Fund. 1985. Prescription for Change, quoted in Bircher, John. J., and Burton Ziskind. 1986. The Cost of Graduate Medical Education. The Health Studies Task Force, Office of the Assistant Secretary of Defense.

Thorpe, Kenneth E. 1988. The use of regression analysis to determine hospital payment: The case of Medicare's indirect teaching adjustment. Inquiry 25 (Summer): 219-31.

U.S. Department of Defense. 1993. Graduate Medical Education. By Program, Analysis, and Evaluation Office. 12 October 1993.

U.S. Department of Defense. Assistant Secretary of Defense (Health Affairs), Assistant Secretary of Defense (Force Management and Personnel), and Comptroller of the Department of Defense. 1991. Medical Expense Performance and Reporting System for Fixed Military Medical and Dental Treatment Facilities (DOD 6010.13-M). [Washington, D.C.]: U.S. Department of Defense. Assistant Secretary of Defense (Health Affairs), Assistant Secretary of Defense (Force Management and Personnel), and Comptroller of the Department of Defense.

U.S. Department of the Army Health Services Command. 1992. Orientation issue, HSC Mercury, 1-23

U.S. Department of the Army Health Services Command. 1992a. U.S. Army Health Services Command Board of Directors Meeting. By Headquarters, U.S. Army Health Services Command. 24 July 1992.

Valberg, Leslie S., and Merideth A. Gonyea. 1993. Design of a future academic medical center: Financial construct. University of Western Ontario and The Center for Health Policy studies.

Whelan, Thomas J. Jr. 1974. Why residency programs in the military: The impact of history and influencing forces. Military Medicine 139 (April): 256-72.

Wing, Paul. 1972. Clinical costs of medical education. Inquiry 9 (December): 36-44.